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MUSEUMS ASSOCIATION.

REPORT OF PROCEEDINGS

WITH THE PAPERS READ AT THE

SIXTH ANNUAL GENERAL MEETING,

HELD IN NEWCASTLE-UPON-TYNE.

JULY 23RD—26TH, 1895.

EDITED BY

H. M. PLATNAUER, B.Sc., & E. HOWARTH, F.R.A.S.

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DULAU AND CO.

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CONTENTS.

	PAGE
INTRODUCTION ..	v
LIST OF MUSEUMS AND ASSOCIATES	viii
MINUTES OF GENERAL MEETING ..	xi
INCOME AND EXPENDITURE..	xii
OFFICERS AND COUNCIL ..	xiii
PROGRAMME OF ARRANGEMENTS ..	xiv
RULES ..	xvi
ADDRESS OF THE PRESIDENT, THE REV. CANON NORMAN, M.A., D.C.L., F.R.S., ETC. ..	i
A NEW PRESERVATIVE. BY E. M. HOLMES AND H. O. FORBES, LL.D.	30
THE UTILITY OF PLASTER CASTS IN A COLLECTION OF PRE- HISTORIC ANTIQUITIES. BY F. W. RUDLER, F.G.S. ..	37
MUSEUM LIBRARIES. BY W. WHITE, F.L.S. ..	41
THE ARRANGEMENT OF A GEOLOGICAL MUSEUM. BY H. BOLTON, F.R.S.E. ..	50
THE PRINCIPLES OF MUSEUM ADMINISTRATION. BY G. BROWN GOODE, ASSISTANT SECRETARY OF THE U.S. NATIONAL MUSEUM	69
THE DEVELOPMENT OF A LOCAL MUSEUM. BY A. MEEK, B.Sc., F.Z.S. ..	149
A NATIONAL MUSEUM OF AGRICULTURE. BY A. MEEK, B.Sc., F.Z.S. ..	162
THE USE OF XYLONITE FOR MOUNTING SPIRIT PREPARATIONS. (Abstract.) BY E. HOWARTH, F.R.A.S. ..	166
APPENDIX TO THE PRESIDENT'S ADDRESS ..	167
GENERAL NOTES ..	168

INTRODUCTION.

THE Sixth Annual Meeting of the Museums Association was, from every point of view (except, perhaps, that of attendance), a most satisfactory one. None of the local elements of a successful meeting was lacking. Our President was not only indefatigable in his application to business, but was able, in consequence of his wide range of knowledge, to give effective and pertinent criticisms of all papers read at the meeting. In addition to this, his genial and kindly manner inspired that feeling of union and friendliness which is so necessary to meetings of this nature. The arrangements made by the Local Secretary were well planned and successfully carried out, and his efforts were seconded by an influential Committee. The city, too, is rich in collections and in the traditions of famous and active collectors. Visitors also had the advantage of seeing a Museum building which was specially designed for the effective exhibition of specimens and which is probably the best adapted for that purpose of any in the kingdom.

It cannot be too often pointed out that the utility of these meetings depends largely on the number of representatives of different Museums who attend them.

The good derived from our meetings by those who are present is often of an intangible kind. It is not to be measured simply by papers, however good, or by Annual Reports, however bulky. But it *is* to be measured by the knowledge and encouragement gained by the Curator from contact, often of an informal kind, with his fellow-workers.

The members present at this meeting enjoyed an unusual privilege in their visit to the President's collection of Marine Invertebrata at Burnmoor. The methods employed by Canon Norman in the preservation and storing of his collection were at once so simple and so effectual that many of his visitors must have carried away practical hints of a most useful character. The Canon not only exhibited his collections and displayed his methods of working, but also gave a very interesting demonstration on the specific variations of some of our commoner Gasteropoda, illustrating his remarks by specimens from his collections.

The expedition to Durham was of a most interesting character. Under Canon Tristram's able guidance, the Castle, University Buildings, and the Cathedral were explored, and their chief points of interest were explained. Canon Tristram kindly invited the members of the expedition to his house, where they were hospitably entertained by Mrs. Tristram, and had an opportunity of seeing the Canon's well-known collection of birds.

At the Conversazione in the Hancock Museum the members had the privilege of meeting, under most pleasant circumstances, with several of the citizens of Newcastle who were prominently connected with Museum work.

The visit to Marsden Rock, on the last day of the meeting, under the guidance of Mr. R. Cameron, M.P., was somewhat marred by the unfavourable weather, which throughout the whole time of the meeting was almost uninterruptedly wet, the only variation being occasional thunderstorms. Despite all this, the geological lessons of the Marsden Rock were intensely interesting to the many members who braved the storm. Afterwards the members went on to Sunderland where Mr. Cameron acted as guide to the well-arranged, and exceedingly instructive museum, whose unrivalled collection of Permian fossils were particularly, if not enviously, inspected by the visitors, who were afterwards gracefully and pleasantly entertained to tea by Mrs. Cameron. The kindness and hospitality of the Mayor of Sunderland in inviting the Association to dinner, where they had the opportunity of meeting the members of the Town Council and other leading citizens, was most gratifying. A most satisfactory feature was the warm testimony borne by all the speakers at the dinner to the great value attached by municipal authorities to Museums in the influence on the higher and brighter life of the people.

LIST OF MUSEUMS AND ASSOCIATES

BELONGING TO THE ASSOCIATION, WITH THE NAMES OF THE REPRESENTATIVES
AT THE NEWCASTLE-ON-TYNE MEETING.

Barnard Castle		Manchester : Owens
(Bowes Museum)		College - <i>Mr. W. E. Hoyle,</i> <i>M.A.</i>
Baroda	-	.. Queen's Park -
Belfast	-	Middlesborough -
Blackburn	-	Newcastle-upon-
Bolton	-	Tyne - - - <i>Prof. M. C. Potter,</i> <i>M.A., Mr. R. Howse,</i> <i>Mr. A. H. Dickinson</i>
Bootle	-	Northampton -
	-	Nottingham - - - <i>Prof. J. W. Carr,</i> <i>M.A., F.G.S.</i>
Bradford	-	Oxford Museum of
Brighton	-	Comparative
Cape Town (South		Anatomy.
African Museum)		Perth - - - <i>Mr. H. Coates,</i> <i>F.R.S.E., Mr. J.</i> <i>Ramsay, Mr. A. M.</i> <i>Rodger.</i>
Cardiff	-	Saffron Walden -
Chester	-	Salford - - -
Christchurch, New		Salt Lake City
Zealand-	-	(Deseret Museum)
Dundee-	-	Sheffield : Public
Glasgow	-	Museum - - <i>Ald. W. H. Brittain,</i> <i>F.R.G.S., Mr. E.</i> <i>Howarth, F.R.A.S.</i>
Hereford	-	.. Ruskin Museum <i>Mr. W. White.</i>
Ipswich	-	Southampton - -
Liverpool	-	Stockport - - - <i>Mr. J. Tym.</i>
London : Horniman's		Sunderland - - - <i>Ald. R. Cameron,</i> <i>M.P., Mr. J. M. E.</i> <i>Bowley.</i>
Museum.		Sydney (Australian
.. Parkes Museum		Museum) - - -
of Sanitary		Warrington - - - <i>Mr. C. Madeley.</i>
Institute.		Worcester - - - <i>Mr. W. H. Edwards.</i>
,, Sir Henry Peek's		York - - - <i>Mr. H. M. Platnauer,</i> <i>B.Sc.</i>
Museum.		
,, Pharmaceutical		
Society -	-	
	-	
..	-	
Maidstone	-	
	-	
	-	
	-	
Manchester : Ancoats		
Hall	-	

ASSOCIATES.

- Anderson, Prof. W. C. F., Firth College, Sheffield.
 Assheton, R., Birnam, Cambridge.
Bainbridge, T. H., Newcastle.
 Bather, F. A., British Museum.
Bell, Thomas, Newcastle.
Bolton, H., F.R.S.E., Owen's College, Manchester.
 Brady, Prof. G. S., M.D., F.R.S.
Branford, W. E., Newcastle.
Brooks, J. C., Newcastle.
 Brown-Goode, G., Assistant Secretary U.S. National Museum.
 Brunchorst, Dr. J., Bergens Museum, Bergen.
Carr, Mrs., 128, Mansfield Road, Nottingham.
 Cheeseman, J. F., Auckland Museum, New Zealand.
Clephan, R. C., Newcastle.
Cochrane, Wm., Newcastle.
Cooke, R. W., Newcastle.
Crawhall, G. E., Newcastle.
 Croston, J. W., 29, Ostrich Lane, Prestwich.
Daglish, John, Newcastle.
 Denny, Prof. Alfred, Firth College, Sheffield.
Dixon-Brown, Rev. D., M.A., Newcastle.
 Donner, E., Oak Mount, Fallowfields, Manchester.
 Donner, Mrs E., Oak Mount, Fallowfields, Manchester.
Elphick, G., Newcastle.
Emley, F., Newcastle.
Ferguson, John, Newcastle.
 Flower, Prof. Sir W. H., British Museum.
Foster, Robt., Newcastle.
Gibb, Dr., Newcastle.
Gibson, F. G., Newcastle.
Green, R. Y., Newcastle.
 Greening, Linnæus, 5, Wilson Patten Street, Warrington.
 Greenwood, Thomas, Frith Knowl, Elstree, Herts.
 Henshaw, Samuel, Boston Society of Natural History, Berkeley Street,
 Boston, Mass.
Howden, Prof. R., M.A., M.B., Newcastle.
Howse, Richard, Newcastle.
 Hughes, Prof. T. McKenny, Woodwardian Museum, Cambridge.
 Hutton, Capt. F. W., Canterbury Museum, Christchurch, New Zealand.
Irving, G., Newcastle.
Jackson, Joseph, Newcastle.

LIST OF ASSOCIATES—*continued.*

- Jackson, Dr. Robert T., Harvard University.
 Jennings, A. Vaughan, F.L.S., F.G.S., London.
 Longfield, T. H., F.S.A., Science and Art Museum, Dublin.
 Lucas, F. A., Curator Dept. of Comp. Anat., National Museum, U.S.A.
Martiu, N. H., F.L.S., F.R.M.S., Newcastle.
 Martin, R. F., 30, Barratt Avenue, Wood Green, London, N.
 Meyer, A. B., M.D., Museum, Dresden.
 Monks, F. W., Brooklands, Warrington.
Moore, J. M., Newcastle.
Murray, Prof., M.A., M.B., Newcastle.
Norman, Canon, M.A., LL.D., F.R.S., Burnmoor.
Oliver, Prof., M.A., M.D., Newcastle.
 Parker, Prof. T. Jeffrey, D.Sc., F.R.S., Otago University Mus. Dunedin,
 New Zealand.
Pelegrin, M. J., Newcastle.
Philipson, John, Newcastle.
Philipson, Prof., M.A., M.D., D.C.L., Newcastle.
Phipson, Miss Emma, 5, Park Place, Upper Baker Street, London.
Potter, Prof. M. C., M.A., Newcastle.
Pybus, W. M., Newcastle.
Rich, F. W., Newcastle.
Robson, Robt., Newcastle.
Rudler, F. W., F.G.S., Museum of Practical Geology, Jermyn-st., London.
Sanderson, W. J., Newcastle.
 Scharff, Dr. R. F., Museum of Science and Art, Dublin.
Somerville, Prof. D., D.Ec., F.L.S., Newcastle.
Spence, J. F., Newcastle.
 Stirrup, Mark, High Thorn, Bowden, Cheshire.
Thompson, Thomas, Newcastle.
 Weiss, Prof. F. E., Owens College, Manchester.
 Woodward, A. Smith, British Museum, London.
 Yates, George C., F.S.A., Hon. Sec. Lancashire and Cheshire Antiquarian
 Society, Swinton, Manchester.
Yould, John G., Newcastle.

M I N U T E S
OF
GENERAL MEETINGS HELD JULY 25TH & 26TH.

JULY 25TH.

The PRESIDENT announced that the next place of meeting was Glasgow. BAILLIE BURT on behalf of the Corporation of Glasgow invited the Association to hold the Annual Meeting for 1896, in the City of Glasgow, and assured the members of a welcome.

The PRESIDENT then put before the meeting the list of Council and Officers proposed by the outgoing Council, pointing out that the election of a President had better be deferred till the wishes of the Glasgow authorities had been ascertained.

Mr. OGLE proposed, "that the Council be elected forthwith and that the question of electing a President be left to the Council."

PROFESSOR CARR seconded the proposal.

Mr. HOYLE moved as an amendment, "that the election of the Council and Officers stand over till the following day."

The amendment was seconded by Mr. FORBES and carried.

The PRESIDENT then moved the following Resolution which was seconded by Mr. FORBES and carried unanimously.

"That the President and Members of the Museums Association desire to express their sympathy with Mrs. Ball in her loss, and to record their deep sense of the services of Dr. BALL as a Past President and constant friend of the Association."

The HONORARY TREASURER read the Financial Statement, which was unanimously adopted by the meeting.

JULY 26TH.

The list of members of Council nominated by the outgoing Council was adopted by the meeting.

The PRESIDENT proposed Mr. JAMES PATON F.L.S., for President Elect as nominee of the Council.

BAILLIE BURT seconded this proposal which was carried unanimously.

Mr. Paton's election having left a vacancy on the list of Council just adopted, Mr. H. COATES, President of the Perthshire Natural History Society, was elected a member of Council.

The Hon. Treasurer and Hon. Secretaries were re-elected.

On the proposal of Mr. HOYLE, seconded by PROFESSOR CARR, it was resolved that the Secretaries be desired to use their discretion as to whether papers should be published in extenso or in abstract.

MUSEUMS ASSOCIATION.

STATEMENT OF INCOME AND EXPENDITURE FOR THE YEAR ENDING JUNE 1895.

	<i>Receipts.</i>	<i>£ s. d.</i>	<i>Expenditure.</i>	<i>£ s. d.</i>
Balance from previous Year	Rent of Room in Dublin ..	2 2 0
Members' Arrears, 1893	..	1 1 0	Shorthand Writers' Notes (one-half cost) ..	3 10 0
" Subscriptions, 1894	..	35 14 0	Binding Reports ..	1 0 0
		<u>36 15 0</u>	Printing ..	3 14 3
Associates' Arrears, 1892	..	0 10 6	Postage of Reports
" " Subscriptions, 1893	..	1 11 6	Printing Reports for 1894
		<u>48 6 0</u>	Postage, Disbursements, &c. (E.H.) ..	5 12 4
Annual Reports	(H.M.P.)
Advertisements	Banker's Commission ..	0 3 9
Banker's Interest	Balance ..	90 6 6
				<u>45 6 9</u>
		<u>£135 13 3</u>		<u>£135 13 3</u>
Balance brought forward		
Members' Subscriptions, 1895		
Associates' Subscriptions, 1895		
		<u>£55 16 9</u>		
Subscriptions in Arrears, 1 Member, 1894	..	1 1 0	Cash in Bank ..	59 2 3
" 2 Associates, 1894	..	1 1 0	Less Cheques unpresented ..	3 6 6
		<u>22 2 0</u>		<u>£55 16 9</u>

OFFICERS AND COUNCIL.

President :

The Rev. CANON NORMAN, M.A., D.C.L., F.R.S., F.L.S.

President Elect :

JAMES PATON, F.L.S.

Vice-Presidents :

The Rev. CANON TRISTRAM, D.D., F.R.S.

W. A. WATSON-ARMSTRONG, M.A., J.P.

Past Presidents :

J. W. CLARK, M.A. W. BOYD DAWKINS, M.A., F.R.S.
Sir W. H. FLOWER, K.C.B., D.S.C., F.R.S.

Treasurer :

Alderman W. H. BRITTAINE, J.P., F.R.G.S., (Sheffield).

Council :

R. CAMERON, M.P., J.P. (Sunderland).
F. A. BATHER, M.A., (British Museum).
Professor J. W. CARR, F.L.S., M.A.,
F.G.S., (Nottingham).
H. COATES, (Perth).
W. E. HOYLE, M.A., (Manchester).
F. JAMES, (Maidstone).

Professor E. RAY LANKESTER, M.A.,
LL.D., F.R.S., (Oxford).
C. MADELEY, (Warrington).
W. W. MIDGLEY, F.R.M.S., (Bolton).
F. W. RUDLER, F.G.S., (London).
Councillor STEELE, (Glasgow).
Professor Dr. J. E. TALMAGE, (Salt
Lake City).

General Secretaries :

H. M. PLATNAUER, B.Sc., F.G.S. (York).
E. HOWARTH, F.R.A.S., (Sheffield).

Local Secretary :

Professor M. C. POTTER, M.A., F.L.S. (Durham College of Science,
Newcastle-upon-Tyne.)

Local Treasurer :

A. H. DICKINSON.

Local Committee :

Professor BRADY, M.D., F.R.S.
R. CAMERON, M.P., J.P.
D. EMBLETON, M.D., F.R.C.P.
F. EMLEY.
Principal H. P. GURNEY, M.A., F.G.S.
J. HARDY, LL.D.
A. HOLMES.
Professor R. HOWDEN, M.B., F.R.S.E.
RICHARD HOWSE.
The Rev. W. JOHNSON.
The Rev. R. H. KERR.
Professor G. A. LABOUR, M.A., F.G.S.
N. H. MARTIN, F.L.S., F.R.M.S.
Professor G. R. MURRAY, M.A., M.B.,
M.R.C.P.

Professor T. OLIVER, M.A., M.D.,
F.R.C.P.
J. PATTINSON, F.I.C., F.C.S.
H. A. PAYNTER.
Professor PHILIPSON, M.A., M.D., D.C.L.,
F.R.C.P.
J. PHILIPSON, J.P.
W. M. PYBUS.
T. B. SANDERSON, (Sheriff of New-
castle).
Alderman J. F. SPENCE, J.P.
Professor SOMERVILLE, D.C.E.C., B.Sc.,
F.L.S.
The Rev. A. WATTS.

PROGRAMME OF ARRANGEMENTS.

TUESDAY, JULY 23RD.

2 p.m. 3 p.m. 4 p.m. 7.30 p.m.	<p>Reception Room open. [Ladies' Common Room, College of Science.]</p> <p>Meeting of Council.</p> <p>Visit to Castle and Museum of Antiquities. Members received by Mr Blair, the Secretary of the Society of Antiquities.</p> <p>Opening Meeting in the Physical Lecture Theatre of the College of Science, at which the Rev. CANON NORMAN, M.A., D.C.L., F.R.S., delivered his Presidential Address.</p>
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WEDNESDAY, JULY 24TH.

10 a.m. to 12-30 p.m. 1.50 p.m. 8 p.m.	<p>Reading and Discussion of the following Papers, in the Physical Lecture Theatre :</p> <p>"On the Development of a Local Museum," by A. MEEK, B.Sc., F.Z.S.</p> <p>"The Principles of Museum Administration," by G. BROWN GOODE, Assistant Secretary of the U.S.A. National Museum.</p> <p>Visit to Durham Cathedral and Castle. (Mrs. TRISTRAM kindly invited the Members to Tea.)</p> <p>Conversazione in the Hancock Museum.</p>
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THURSDAY, JULY 25TH.

10 a.m. 11 a.m.	<p>Reading and Discussion of the following Papers :</p> <p>"On the Utility of Plaster Casts in a Collection of Prehistoric Antiquities," by F. W. RUDLER, F.G.S.</p> <p>"On Museum Libraries," by W. WHITE, Ruskin Museum, Sheffield.</p> <p>"On a New Preservative," by E. M. HOLMES.</p> <p>General Business Meeting.</p>
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TUESDAY JULY 24TH.—Continued.

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- 2 p.m. Visit to the President's Collections at Barnard Recovery, Fencott Houses.
- 7.30 p.m. Association Dinner at the County Hotel.
-

FRIDAY, JULY 26TH.

-
- 10 a.m. Reading and Discussion of the following Papers
"On the arrangement of a Geological Museum," by
H. BOLTON, F.R.S.E.
"On the use of Xylonite for Mounting Spirit Preparations," by E. HOWARTH, F.R.A.S.
"Why not a National Museum of Agriculture ?," by
A. MEEK, B.Sc., F.Z.S.
- 12.35 p.m. Visit to Sunderland Museum. Dinner and Reception
in the Evening by kind invitation of the Mayor
of Sunderland.
-

MUSEUMS ASSOCIATION RULES.

- 1.—That this Association be called the "MUSEUMS ASSOCIATION," and shall consist of representatives of the Museums situated in the United Kingdom, and of other persons engaged in scientific work or interested in Museums, who may be admitted as Associates.
- 2.—The object of the Association shall be the promotion of better and more systematic working of Museums throughout the Kingdom. In order to promote a better knowledge of Museums, the Association shall meet in different towns each succeeding year.
- 3.—That each Museum contributing not less than one guinea a year be a Member of the Association, and that individuals interested in scientific work be admitted as Associates on payment of 10s. 6d. annually.
- 4.—That each Museum be represented by three delegates, each having one vote. Each Associate to have one vote.
- 5.—That each Museum belonging to the Association and each Associate receive one copy of the publications of the Association.
- 6.—That the affairs of the Association be managed by a Council consisting of a President, two Vice-Presidents, two Secretaries, a Treasurer, and twelve ordinary Members. Three to constitute a quorum. All past Presidents to be *ex-officio* Members of Council. The President, Vice-Presidents, and two ordinary Members of Council, to retire each year and to be ineligible for re-election for one year.
- 7.—The Council to be elected at the Annual General Meeting, and to hold office for one year. The Council shall have power to fill any vacancies that may occur in its ranks between Annual Meetings.
- 8.—That a General Meeting of the Association be held annually, for the transaction of business, the reading of papers, and the discussion of matters relating to Museums.
- 9.—The place and time of the Annual Meeting to be determined by the Council.
- 10.—All new rules, and all resolutions affecting existing ones, to be submitted to the Annual General Meeting. One calendar month's notice to be given of all resolutions affecting the rules.

A D D R E S S

BY

THE REV. CANON NORMAN, M.A., D.C.L., F.R.S.,

President of the Museums Association.

GENTLEMEN OF THE MUSEUMS ASSOCIATION,

In the name of the Naturalists and others interested in science in the North of England, I bid you welcome to Newcastle. We feel honoured that after your visits to Liverpool, Cambridge, Manchester, London, and Dublin, you should next in order have chosen this metropolis of the Northern Counties as your place of meeting, and we trust that you will have no cause to regret the decision at which you arrived on this question.

Allow me next to offer you my sincere thanks for the high honour you have paid me in selecting a private naturalist like myself to be your President for the year. Having done so, I trust that you will extend to me your kind indulgence should I in any way fall short in the fulfilment of the duties incumbent upon me—duties which at the last two meetings have been discharged by men of such eminence as Sir William Flower, and Dr. Valentine Ball, the heads of the National Museums of England and of Ireland respectively.

THE LATE DR. VALENTINE BALL.

In the mention of Dr. Valentine Ball I must have touched a chord of sadness in the hearts of my hearers. Many of you had the pleasure of knowing him. Many of you carried back to England last year pleasant memories of the amiability and urbanity, the energy and zeal, the knowledge and capacity of the President who contributed so largely to the enjoyment and success of your meeting at Dublin. I was looking forward to his presence here this day, and to being introduced to you by the retiring President, when, a month ago, my eye fell on the paragraph in the *Times* which announced his death. I am indebted to my old friend Professor Percival Wright for the use of a short memoir of Dr. Ball, some brief extracts from which will, I cannot doubt, be of interest to you.

Dr. Valentine Ball was the second son of Dr. Robert Ball, who had been for many years Secretary to the Queen's University of Ireland, as well as Director of the Museum of Trinity College, Dublin; and was born on the 14th of July, 1843. His father died in 1857, at a time when his son was just entering Trinity College, Dublin. Valentine Ball passed the examination for B.A. degree in 1864, and in the same year was appointed on the staff of the Geological Survey of India. That survey had its origin in the desire of the Government that the Coal-Fields of the country should be systematically investigated; and most of Dr. Ball's reports and memoirs have relation to the various Indian coal deposits. Subsequently a general Geological Sketch Map of nearly the whole of India was published, together with three volumes of descriptive matter, the last volume relating to economic geology compiled by Dr. Ball, and was issued in 1881. In that same year he resigned the position of Deputy

Superintendent of the Geological Survey of India, having been appointed to succeed the Rev. Dr. Haughton as Professor of Geology and Mineralogy in the University of Dublin. He only retained that professorship a short time, relinquishing it in 1883 in order to preside over the fortunes of the Dublin Museum of Science and Art, the foundation stone of which had then still to be laid. Into the anxieties and difficulties, the progress and success of that Museum he threw all the energies and powers of his well-stored and active mind during the remainder of his life. He died on the 15th day of June, 1895. His scientific writings had been very numerous, and among the larger works were his "Jungle Life in India," and a model and charming edition of the "Travels of Travernier."

THE NEWCASTLE NATURALISTS OF THE PAST.

It will be my purpose to bring before you a brief history of the progress of Biology in Newcastle, with especial reference to its Museums; and it would be the neglect of an obvious duty if, as introductory to this, reference was not made to the little band of able Naturalists of a past generation, since to them was due the origin of the two Societies still working here:—"The Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne," and "The Tyneside Naturalists Field Club."

"WEDNESDAY EVENING MEETINGS."

About the year 1829 certain scientific men, among whom were Joshua Alder, William Hutton, Thomas, John, and Albany Hancock, William Hewetson, George Waites, George Burnett, William Robertson, and the Rev. George Abbs, conceived the idea that it would be at once pleasant,

profitable, and advantageous in all ways if they should meet together frequently for the purpose of conversation and discussion on the several branches of Natural History, to the study of which they were devoting their time. To this end they instituted "*Wednesday Evening Meetings*," for such was the designation by which these friendly gatherings were known. They were held fortnightly, at 7 o'clock, in the houses of the members in turn. All unnecessary expense was avoided ; a simple tea was given by the host, while two things were distinctly forbidden—discussion on political topics and the use of alcohol. Any discovery made by a member was communicated, specimens of interest were exhibited, and the conversation was for the most part confined to scientific subjects, and the meeting usually broke up about midnight. Naturalists who resided in neighbouring places or who were passing through Newcastle, were frequently invited guests, and as such a guest I was, when a young man, once present and enjoyed a delightful evening.

Before the party separated the next house of meeting was fixed, and invitations were then given to those who did not themselves entertain ; but it was always understood that any member was at liberty to bring with him any Naturalist who was temporarily in the town. Joseph Blacklock, R. S. Bowman, and Dr. Embleton became members at a later period, and the last named venerable physician, known not only by his own numerous writings but also by the fact that long years ago he assisted Albany Hancock in his earlier anatomical investigations,* is the only still surviving member. Mr. R. G. Green and our excellent

* e.g.—A Hancock and D. Embleton on the Anatomy of *Eolis*, a genus of Mollusks of the Order *Nudibranchiata*.—*Ann. Mag. Nat. Hist.*, Vol. xv., 1845, and Ser. 2, Vol. I., 1848, and Vol. II., 1849.

Curator, Mr. R. Howse, were however frequently invited guests.

It is to Mr. Howse that I am indebted for most of the particulars respecting this Club. He tells me that he was a regularly invited guest from the year 1846,* and that in 1857 he attended a meeting held at Mr. Blacklock's lodgings, at the Barras Bridge, to meet an old friend, Wm. Kenneth Loftus, who had just returned from his Assyrian Expedition, and then visited Newcastle for the last time. This was the latest occasion on which he attended, but the Wednesday Evening Meetings seem to have lingered on for a year or two more and then gently expired, having fulfilled their mission, about 1860.

It has seemed especially desirable to call the attention of the Members of the "Museums Association" to these "Wednesday Evening Meetings," and to the stimulus they were the means of giving to the study of Natural History here; since the establishment of such friendly, social and scientific gatherings in other towns might be productive of much good in bringing men of kindred tastes into closer association and creating an impetus towards active work. For you will notice that the members of these meetings for the most part became eminent in the branch of science to which each more especially devoted himself, while at the same time they were continually gaining knowledge, and more extended range of interest, from the association with those who were pursuing different paths through the vast fields of Natural Science.

* I may mention that it was in the following year, 1847, that Mr. Howse published his first paper known to me in *Ann. Mag. Nat. Hist.*, Vol. XIX., on the Dogger Bank "Fusi" and their ova-capsules and embryos, illustrated by an admirable plate.

TYNESIDE NATURALISTS' FIELD CLUB.

It will be convenient now, before coming to the history of the Museum, to refer to the Tyneside Naturalists' Field Club.

The "Berwickshire Naturalists' Field Club," still in a flourishing condition, has the honour of being the oldest Field Club in the kingdom; and the Tyneside Club is the next oldest, and may be in some measure considered on offspring of that of Berwickshire, since Ralph Carr, Esq., of Dunstan Hill, who was a member of the Berwickshire Club, took a very active part in starting it, and was its first President.

The first meeting of the Tyneside Naturalists' Field Club was held on the 25th day of April, 1846, in a room of the Natural History Society, the Rev. R. C. Coxe, Vicar of Newcastle, being in the chair; at this meeting the rules were drawn up. At the ensuing meeting, held on May 11th, it was resolved that the Club, besides holding Field Meetings, "undertake the formation and publication of correct lists of the various natural productions of the counties of Northumberland and Durham, and also that a succinct account of the Geology of the district be prepared." It was further resolved that "local collections be formed and placed, with the consent of the Natural History Society, in the Newcastle Museum." Sub-committees to carry out these views were appointed, and included many still honoured names. In various branches of Zoology—John and Albany Hancock, R. E. Bewick, M. J. T. Sidney, J. H. Fryer, Joshua Alder. In Entomology—James Hardy, J. T. Bold, John Hancock, and Thomas Pigg, Junr. In Botany—Messrs. Thornhill, Thompson, J. Storey, and Rev. J. T. Bigge. In Geology—Messrs. Hutton, Fryer, Sopwith, Loftus, and King.

From the first the "Transactions of the Tyneside Naturalists' Field Club" took a high place in Natural History literature, and this continued during the lives of those able naturalists, who were its parents: and I well recollect Dr. John E. Gray, a most competent judge, speaking to me of those Transactions as the most valuable provincial Natural History publication in the kingdom. Our naturalists now are fewer in number, and neither the Club nor its publications are in the flourishing condition they once were. Let us hope that a time of revival will come. There have been published six volumes of the original "Transactions of the Tyneside Naturalists' Field Club," and eleven of the new series, which dates from 1865, from which period the joint papers of "Natural History Society" and of the "Tyneside Naturalists' Field Club," have been issued under the title of "Natural History Transactions of Northumberland and Durham."

THE MUSEUM.

The first acquisition by the town of Newcastle of anything in the nature of a Museum was effected in 1823. In that year there was purchased by private subscription and presented to the "Literary and Philosophical Society what had been known as the 'Tunstall Museum,' or 'Wycliffe Museum,' and at a later period as the 'Allan Museum.'"

This Museum was not without historical interest. The original collection was of great extent and very varied character. It had been brought together by Marmaduke Tunstall, Esq. This gentleman was born in 1743, and resided in Yorkshire, at Wycliffe-on-the-Tees; thus it was that the Museum acquired the first two names which have been already mentioned, one after the collector himself, the other after the name of his seat. It embraced

animals belonging to many classes, both vertebrate and invertebrate; antiquarian objects, and the ornaments, implements and weapons of savage nations. "Many of these articles are understood to have been collected during the voyages of Captain Cook, from some of the inscriptions on them, and also from the title of Mr. Allan's MS. catalogue of the Museum. Indeed some of them so exactly resemble the engravings in Captain Cook's voyages, as to induce the belief that they are the actual articles which formed the types of the drawings," while others had formed part of the Leverian Museum, and others correspond with the account of the articles in Keates' account of the Pelaw Islands. As regards the Zoological department, the birds were by far the most fully represented class, and they alone were said to have cost not less than £5,000. Among birds from this collection still in the Museum are a British specimen of the Red-breasted Goose and the immature example of the Great Auk. In the year 1771 Mr. Tunstall himself printed a list of British Birds, as, however, it was privately printed, it has been little known.* Many birds and insects from the Tunstall Museum were described and figured in Peter Brown's "New Illustrations of Zoology," 1776, and they filled 17 out of the 50 plates. Mr. Tunstall died on October 11th, 1790.

Previous to Tunstall's death, Bewick had engraved for him "The Chillingham Bull," and Tunstall had offered to assist the artist in his projected work on birds. After his decease, his nephew and successor, Edward Sheldon Constable, invited the famous engraver to spend some

* *Ornithologia Britannica; seu Avium omnium Britannicarum tam terrestrium, quam aquaticarum catalogus, sermone lat., ang. et gallico redditus, cui subjicitur appendix, Aves alienigenas, in Anglia raro advenientes, complectus a Marmaduke Tunstall. Roy. fol. Londini, 1771.*

time at Wycliffe, in order that he might draw such birds as he desired before the collection was sold ; and in the advertisement in the 2nd volume of the 1st edition of "British Birds," 1804, Bewick says : " During a residence there of nearly two months in 1791, I took drawings from most of the British species (and some Foreign ones) ; and many of these were afterwards traced and engraved on the blocks of wood, but in the progress of the work so many other more recent specimens, both dead and living, were furnished by the patrons of the work, that the necessity of using several of these drawings was superseded by the more near approach to perfect nature " ; but, nevertheless, at least forty-four of these species were drawn from Tunstall's examples.

In 1791 the Tunstall or Wycliffe Museum was sold by its then owner, Mr. Constable, and was purchased for the very modest sum of £700 by George Allan, Esq., of Grange, near Darlington. Mr. Allan had previously devoted much time to Antiquarian and Genealogical researches ; and to him Hutchenson was indebted for very great assistance in the preparation of his "History of Durham." Mr. Allan also had a printing press, with which he privately printed many Antiquarian tracts and other papers. In 1775 he formed the acquaintance of Thomas Pennant, and correspondence was kept up between them during the following twenty-three years.

Mr. Allan died in 1800, in his 65th year. He had made considerable additions to the Museum while it had been in his possession ; and the collection of Birds had been made use of by Dr. Latham in his "*General Synopsis of Birds*," and by Colonel Montague in his "*Ornithological Dictionary*." After Mr. Allan's death it remained in the possession of his son until the year 1823, when, what was then known as the "Allan Museum" was purchased for £400

and presented to the "Literary and Philosophical Society." But long years of utter neglect had entirely ruined very much of the collection. Many of the specimens when they reached Newcastle were in a sad state of decay, and this more especially was the case with a large number of the birds, so much so that Albany Hancock wrote of them, "It was evident to every ornithologist that nearly all the specimens would have to be replaced." In 1826, when the collection was placed in the Museum of the Literary and Philosophical Society, several gentlemen took part in arranging the specimens and in supplying deficiencies.

It soon, however, became quite evident that the funds of the Literary and Philosophical Society were wholly inadequate to supply the necessary means to meet the growing requirements of the Museum, or even to maintain it in its then condition. In 1829 forty-six gentlemen, who were either Naturalists or interested in science, recognising the utter insufficiency of the existing accommodation for the objects of the Museum, conceived the idea of establishing the "Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne," and issued a circular inviting others to join them. The Society was established and an "Introductory Address" delivered by the Rev. William Turner on Sept. 15th of the year named. The "Provisional Laws" of the Society were then drawn up and officers elected. We find that during the succeeding year monthly meetings were held, at each of which several papers were read, many of them being of lasting value, and the first half-volume of the quarto Transactions of the Society was published. In the next year the remaining portion of the volume was issued at a cost of about £400. Moreover, the Society now rented a large room in proximity to the Literary and Philosophical

Institute, into which the whole of the foreign birds were removed, so that the walls of the Museum could be devoted to the better exhibition of the British collection. Still, however, it was impossible from want of room to display the Geological specimens. Moreover, Mr. Hutton had offered to deposit his valuable collection of Minerals with the Society for the use of students, an offer of which the Society was most anxious to avail itself, but was unable to do so in consequence of the insufficiency of space. Steps were now therefore taken to prepare plans and collect subscriptions for the erection of a building on the ground behind the Literary Society's premises. On August 1st, 1833, the corner stone of the future Museum was laid by the Mayor; and in 1834 it was opened by the Duke of Northumberland. It had cost £4,716 3s. 9d.

Contributions to the collection now rapidly flowed in, so that as early as in 1838 enlargement was already spoken of. Six years later, however, we find that many of those who had taken most active part in promoting and fostering the Museum were dead, and that, moreover, a period of commercial stagnation had much affected the revenues and caused what in that year's Report was spoken of as the "Society's present depression." In the following year, matters began to improve; many additional subscribers were enlisted, and 30,000 persons visited the Museum, and in the following year the number of entrances rose to 44,000.

Meanwhile the absolute necessity of additional space became more and more pressing, while the lighting of the building was far from satisfactory. In 1862-3 a gallery was erected, and the roof altered so as to give a considerable addition of light, at a cost of £1,070.

What, however, was then thus done could only be regarded as a temporary expedient, and fell very far short

of meeting the immediate requirements of additional space. Nor did the position at that time occupied by the Museum admit of structural enlargement of the building. It was manifest that sooner or later a new Museum must be erected on an entirely different site. It required some man possessed of enthusiasm, energy, and determination to personally take the matter up and carry out the idea in his mind to a successful issue. Such a spirit was found in John Hancock, and it is to his exertions and devotion to the work that Newcastle is indebted for that building, which after his lamented death was named the "Hancock Museum," in memory of the two well-known brothers, Albany and John.

John Hancock was strongly convinced that if a suitable and sufficient building was to be raised it must be mainly done through the liberality of a few rich men interested in science, who must give such sums as would defray the chief outlay, and at the same time inspirit and incite others to contribute liberally according to their lesser means.

On February 27th, 1879, John Hancock brought before the Natural History Society plans which had been prepared by Mr. Wardle in accordance with Hancock's own views as to the best form, size, arrangement and lighting of the rooms for the display of specimens ; at the same time he announced that six of his friends, Lord Armstrong, Colonel John Joicey, Edward Joicey, Esq., Sir Isaac Lowthian Bell, John Rogerson, Esq., and the then late W. C. Hewetson, Esq., had promised donations amounting to more than £18,000. In the autumn of the same year he further made known that a site had been purchased for £6,500 by Colonel Joicey, and presented by him to the Society. And now the scheme was fairly afloat, the contracts for the building were signed, and

other subscriptions flowed in. The ultimate cost of the site and building was £47,877. It was opened by His Royal Highness the Prince of Wales on August 20th, 1884, who was also accompanied by the Princess of Wales and the Princes Albert Victor and George.

The approach to the Museum is from the south. The entrance hall extends across the entire width of the central building, the main staircases are erected in small wings which project southwards at each extremity of the hall, while another small wing extending eastwards is the Committee Room, and the corresponding wing on the western side the Ladies' Room. The main Museum consists of three rooms, each 110 feet long, the central 60, the others 40 feet wide ; these are, in accordance with what is regarded as the most effectual mode of lighting, glass-roofed, with results that all cross-lights are avoided, and an unbroken wall space is obtained for cases ; the walls being utilized not only at the base but also above by the galleries which run round the buildings. East and west of the main rooms are two-storied corridors, each 120 feet long and lighted from the external walls, and, lastly, to the north are situated the Curator's and other work-rooms. Over these work-rooms is a store-room, and over the Entrance Hall is the Library.

Two Newcastle men have been famous among Ornithologists, Bewick on account of the life-like attitude of the Birds illustrated in his work, and John Hancock for his intimate acquaintance with the life, the habits, and the attitude of Birds, and his surpassing skill as a taxidermist, which enabled him to almost reproduce motion and life into the birds which he preserved. In the gallery which surrounds the first room will be found many hundreds of the original Drawings of Bewick, together with a complete set of his woodcuts, many of

them represented by various stages of his proofs; while a case contains a few of the very birds from which his drawings were made.

In the wall cases in the middle room, as well as in many isolated groups, will be found the collection of Birds given by John Hancock to the Museum. The illustrations of Ornithology of our Islands, to be there seen, are a series of pictures in which each bird is brought before the eye with its peculiar characteristics of life, and every feather has been often separately set. Hancock delighted all his life through in lying hid for hours to watch the habits and actions of his feathered friends. In one of the rooms upstairs will be found a large number of his sketches of bird-attitude taken from life, made for his subsequent guidance when setting up the specimens. Sir William Flower, in his President's Address at the Meeting of the British Association at Newcastle in 1889, thus alluded to Hancock's birds: "I cannot refrain from saying a word upon the sadly neglected art of taxidermy; which continues to fill the cases of most of our Museums with wretched and repulsive caricatures of mammals and birds, out of all natural proportions, shrunken here and bloated there, and in attitudes absolutely impossible for the creature to have assumed when alive. Happily there are to be seen occasionally, especially when amateurs of artistic taste and good knowledge of Natural History have devoted themselves to the subject, examples enough—and you are fortunate enough in possessing them in Newcastle—to show that an animal can be converted after death, by a proper application of taxidermy, into a real life-like representation of the original; perfect in form, proportions, and attitude, and almost, if not quite, as valuable for conveying information on these points as the living creature itself. The fact

is that taxidermy is an art resembling that of the painter, or rather of the sculptor; it requires natural genius as well as great cultivation; and it can never permanently be improved until we have abandoned the present conventional low standard and low payment for "bird-stuffing," which is utterly inadequate to induce any man of capacity to devote himself to it as a profession."

Among the more important birds to which your special attention may be directed are the very fine examples of the Birds of Prey, including the beautiful illustrations of Falconry. These groups were shown in the Great Exhibition of 1851. The great group of the attack on Swans by an Eagle was prepared for the Paris Exhibition, but was not sent as the taxidermist was not satisfied with the position which it was proposed to assign to it. Every case, however, in the whole series is worthy of study on account of the life-like reproduction of attitudes in its occupants.

The Museum is rich in the possession of two specimens of the Great Auk (*Alca impennis*, Linn.). One is a young bird, originally in the "Allan Museum," which presents a very rare state of change of plumage. It was re-stuffed by Hancock in 1862. In the same case by the side of this bird will be seen an Upper Mandible which was found in Cave No. 1 at Marsden Rock in 1879, thus proving that there was a time when this bird lived on the Durham coast. The second Great Auk is an adult in very fine condition and plumage, which was received from Mr. Mecklinburg, of Strasburg, in April 1844. It was one of two birds brought from Iceland a year or two before the date named, and is believed to have been one of the last captures. At the same time an egg was procured, which will be found in one of the drawers, accompanied by a large series of

models of other eggs of the same bird executed by Hancock.

The Geological Room contains a most extensive series of the fossils of the Permian and Carboniferous Rocks. Here is the Hutton Collection of Plants, including very numerous types, presented to the Museum by the Mining Institute; the Abbey Collection of Fossil Fish presented by Lady Armstrong; the Trevelyan, Abbs, and Dinning Collections of Permian and Carboniferous species; the Kirkby Collection of Permian Fossils; and, lastly, the magnificent series of types and fine specimens of Amphibia and Fishes from the shale above the Low Main Seam at Newsham, collected and carved out with untiring zeal and skill by Thomas Atthey, who was originally a working man, and ultimately purchased for the Museum by Lord Armstrong.

In the West Corridor, both down stairs and up, Minerals and Rocks will be found very richly represented, and embracing together with specimens from many other sources, the fine collections of Hutton, of Cookson, and of Charlton.

In one of the galleries there are exhibited the exquisitely beautiful drawings by Albany Hancock of Nudibranchiate Mollusca; which were prepared for the illustration of Alder and Hancock's "Monograph of the British Nudibranchiate Mollusca."

Having now drawn your attention to some noteworthy objects displayed in the Museum, it remains that mention should be made of the leading Research Collections which are to be found in the Cabinet Drawers:—

1. John Hancock's Collection of Birds in the Skin.
2. The extremely fine Collections of Nests and Eggs of John Hancock and Frederic Raine.

3. The Coleoptera, Aculeate Hymenoptera, and Homoptera of J. T. Bold.
4. The Lepidoptera of Frederic Raine.
5. The Classical Collections, including numerous types of British Mollusca, Polyzoa, and Hydrozoa, of Joshua Alder, presented to the Museum by Lord Armstrong.

The Curator is Mr. Richard Howse, the able Geologist, who has thrown so much light on the strata of the Northern counties and their fossils; and who also possesses very wide knowledge with respect to various classes in recent Zoology.

THE MUSEUM OF ANTIQUITIES.

The Museum of the *Newcastle Society of Antiquaries* is nearly coeval with the present century. The nucleus consists of the Antiquarian portion of the Allan Museum handed over to the Society of Antiquaries by the Literary and Philosophical Society, who had come into its possession, and who retained for a time the Zoological portion in their own hands. Round this nucleus were gathered the results of various excavations at Borcovicus, Habitancum, and other Roman Stations, also some interesting Saxon Stones and the fragments of the remarkable Rothbury Cross. With the exceptions above mentioned, the treasures of the Museum have been gathered piece-meal through the generosity of individual donors, and there has been no considerable purchase from any other collection.

The Museum is, on the whole, richer in the remains of the Roman than of any other period. There is, however, a large collection of Coins (not exhibited to the general public) including an almost complete series of the Stycas of the Anglian Kings of Northumbria.

A portion of the Museum still remains in its old quarters at the *Norman Keep*, where the Society regularly holds its meetings ; but the larger part, including the almost unique collection of Roman Altars, is now deposited in the buildings known as the *Black Gate*. This interesting edifice, formerly the principal gateway of the Castle, was rescued from destruction and thoroughly repaired by the Society of Antiquaries, and was opened as a Museum on the occasion of the visit of the Archæological Institute to Newcastle in the year 1884. It is important to observe that this Museum is now in course of re-arrangement, a process which it is hoped will be completed by the end of the current year.

The general plan of the collection when thus rearranged will be this :—

1st Floor.—Roman Inscribed Stones.

2nd Floor.—Prehistoric Roman and Mediæval Antiquities.

3rd Floor.—Collections illustrating the local history of Newcastle-upon-Tyne.

The Curators of the Museum are Mr. Charles James Spence, of North Shields, and Mr. Richard Oliver Heslop, of Corbridge.

MUSEUM OF THE UNIVERSITY OF DURHAM COLLEGE OF MEDICINE.

The University of Durham College of Medicine, Newcastle-upon-Tyne, was founded in the year 1851, and admitted into connexion with the University of Durham in 1852.

The Museums of Comparative Anatomy and Pathology, of Materia Medica and Hygiene are open to students.

A catalogue has been issued intended to be used in illustration of the Text Book descriptions of diseased structures.

The number of students who attended the College during the academic year, 1894-95, was 220.

THE PROVINCIAL MUSEUM.

The Museum of the past has been—and in a very great degree remains—the depository of every kind of article which has been presented to it, whether of great or of no value at all, an assemblage of curiosities of nature, of science and of art, in which may occur a stuffed elephant and an Egyptian scarabæus; a magnificent mass of native gold, and a case to illustrate the manufacture of pins; the skeleton of a moa and a Babylonian cylinder; a picture by one of the old masters and an old clay pipe; a glaciated scratched rock and the back-scratcher of a savage; a collection of old fiddles and another of the windpipes of geese; a Roman lamp and a glow-worm; and so on. Can we wonder at the continued cry of the overcrowding of the Museums, when every conceivable kind of thing is crushed into them?

If our Museums are to be hereafter of the educational value which they ought to possess; if the object be instruction and not merely amusement, there must, in the first instance, be an entire reform in what is admitted into the respective Museums.

I trust and venture to prophesy that the day is not far distant when it will be considered a matter of necessity that every large town should be provided with at least three Museums, or departments of a Museum, each of which shall be under the charge of a well instructed and adequately remunerated Curator.

There will be—

1st—*The Natural History Museum*, containing all that relates to nature, whether Geological, Botanical, or Zoological. And, as respects man, it will deal with his body and its structure, who, as being an animal, takes his place in comparative anatomy and physiology.

2nd—*The Ethnological Museum* would have reference to man's productions, so far as they relate to his past and present history. Thus it would include all antiquarian objects, together with everything that brings before the student the manners and customs of the various extinct or existing races.

3rd—*The Museum of Science and Art.*

There are sufficiently broad lines of separation in the foregoing classification, although, of course, there are also very numerous objects which would be equally in place in two, or all three, of such depositories. Such a thing as a finely tattooed New Zealander's head would not be out of place in any of the three, though in each its position would be regarded from a different standpoint; or again, a finely painted mummy case, or a coin, would be rightly deposited in either the Ethnological or Art Museum, though in the first it would be on account of its association with other works of the race of the same period, in the latter to illustrate the amount of skill attained in painting or in the minting process.

Such we may hope to be the future of Museums; but how is most use to be made of such collections as we at present possess? In what is about to be said it must be understood that the remarks are confined to Provincial Museums, and only to the Natural History portion of them, and in the main, indeed, only to the Zoological department.

Firstly, the aim of every Provincial Museum should be an illustration as perfect as possible of the Fauna, Flora, Geology, and Palæontology of the district in which it is situated. Everything else should give way to this. It is the local collection that is of most importance as instructive in the neighbourhood, it is the local collection which, as a rule, unless the Museum contains well-known classical collections or types, the scientific visitor desires to see.

Secondly. No attempt should be made in a Provincial Museum to make large world-wide collections. This can only be attempted in the very largest Institutions. A few months ago a paragraph appeared in one of the Newcastle papers saying that a collection of Mammals was for sale, and suggesting its purchase for the Museum. Had such a collection been purchased by or given to the Museum it would have been a "white elephant" indeed. Local Museums only need sufficient examples to illustrate the different great groups; and this in a large measure should be done by the characteristic portions of the body being separately preserved and duly labelled to direct attention to the distinctive features of the order or family. To crowd a gallery with great things like Elephant and Rhinoceros, Lion and Tiger, Zebra, Deer and such like, which any boy can see in life in the first Menagerie which passes through the town, is the height of folly. Where this is done, how infinitely more profitably might the great space thus wasted have been used.

Thirdly. Let me again drive home the protest which has been lately so often made, against the prevailing crowding of cases with specimens, some good, some indifferent, some bad, in such a way that none of them can be seen to advantage. The inferior specimens of no

special interest should be relegated to the reserve collection, and the space left be occupied by labels printed in clear type, giving the characteristics of the animal or group to which it belongs.

Fourthly. It is now, I trust, being more and more realized, taught especially by those most instructive and highly interesting bays in the entrance hall of the British Museum, that visitors who have walked through the rooms and admired the "pretty things" to be seen there, the gaily plumaged birds, the elegant shells, the lovely butterflies, will be content with what they have seen, and, perhaps, never enter the Museum again; while those who have had their interest awakened and are conscious that they have added to their knowledge from the study of carefully selected specimens, mounted in such a way as to illustrate their habits, or dissected to demonstrate their structure, accompanied with descriptive labels, will come again and again. Examples of what I mean will be found abundantly in the British Museum, and especially in the beautiful groups of Birds, &c., and in the cabinet of the transformations of Lepidoptera of Lord Walsingham, in which case the public are permitted to pull out the drawers which contain them; in the admirable new arrangement in course of progress in the Oxford Museum, under Professor Lankester's direction; or in a most beautiful and teaching collection of Spiders in the Museum at Brussels.

Allow me now further to illustrate my meaning by an example or two. A common edible Crab (*Cancer pagurus*) simply dried and put in a case conveys to the visitor no further information than he sees in the first fishmonger's shop he passes, but let the Crab be dissected, and near it a Lobster treated in a similar manner, each limb mounted separately and named, and its special use indicated, and the

animal now begins to be understood, and also the difference between the Crab and the Lobster appreciated. Then if the organs of the body be injected and then exposed by the removal of the carapace and partial dissection, and the various organs and their purpose indicated, new and, perhaps, lasting interests are awakened. Or take a Starfish, the poor shrunken, shapeless, dried remains of which are often alone to be seen ; let the actinal and abactinal external surfaces be exposed in a well preserved spirit specimen, and the various parts and organs be named; let other specimens be opened, both from above and below, to show the organization ; of another, let the calcareous framework be exhibited, together with separately mounted pedicellariæ and spines, and these last further illustrated by drawings, and there is presented to the visitor an object lesson, while a whole case full of species as commonly preserved would have merely shown that Starfishes differ from each other in form. Or take the Honey Bee, a case of this with the transformation, &c., as prepared and sold in Germany ; or of some large Beetle cannot fail to awaken interest. These will serve as examples of what is desirable throughout the whole range of the animal kingdom.

Fifthly. One great gap too commonly occurring in Provincial Museums is the entire absence of spirit-preserved specimens ; and such an omission implies not merely the presence of many ordinarily represented groups preserved in a highly unsatisfactory manner, but also the total absence of a large number of orders which can only be kept in this manner. Such great and important classes and groups as the Tunicata, the Cephalopoda, the Nudibranchiata, the Nucleobranchiata, the lower Crustacea, the Annelida, the Gephyrea, the Holothuroidea, the Ctenophora, the Siphonophora, and the Actinozoa (if we

except the skeletons of the Corals), must practically, if not actually, be absent from the Museum unless represented by spirit-preserved specimens. The modern mode of preservation, and the use of flat sided jars with dark coloured glass inserted behind the animal will exhibit many of these as among the most lovely objects in a collection; and existing gaps in the chain of organic beings will thus be filled. No money can be better spent by a Curator than the outlay, say to begin with, of £10 to £50 in the purchase of these classes and orders of animals preserved in the marvellous manner in which they are sent out from the "Zoological Station" at Naples; while many of the invertebrates now supplied by the "Biological Laboratory" at Plymouth, are also most satisfactory. When these have been procured a commencement will at least have been made in a right direction.

But there still remain the Protozoa. Here, as regards the *Foraminifera* and *Radiolaria*, models are commonly shown, but it is desirable that these should be supplemented by drawings of the sarcodous animal in life, while the Infusoria and many other groups can only be illustrated by drawings, which, however, should never be wanting.

THE RESERVE OR RESEARCH COLLECTION.

I pass to say a few words on the Reserve or Research Collections. Here the aim should be the reverse of that described in the exhibited collection; for the object to be sought is the preservation of the largest number of specimens in the smallest possible space, provided only that the method of arrangement shall be such that any given species may be immediately found. As a private collector restricted to the limited space of a dwelling-house (aided only by an iron structure in the garden

which contains the spirit preserved larger forms) in which to keep an extensive collection, it has been of necessity the study of long years to accomplish the objects just named.

With a view not only to economy of space, but also to the preservation of the animals in the best way for minute and critical examination, such things as the smaller mammals, birds, &c., should not be mounted but kept in the skin and preserved in glass-topped drawers, and thus protected from the injury of light, &c.

It is of the Invertebrata however that I can speak from experience, and as more than one Museum has adopted my mode of arrangement, I will now bring it before you in the hope that it may be of some service.

The cabinets (see fig. 1) are all of uniform size, four feet high. On each side a narrow door, furnished with a lock at the top and bolt at the bottom secures the drawers (A door open, B door closed). The drawers are interchangeable throughout the whole series of cabinets, and are of three depths, D being twice, and E three times the depth of C.*

It will be observed that the cabinet contains thirty drawers of the C depth, or their equivalent in the deeper drawers. Each C drawer (see fig. 2) measures

	Outside measurement. feet. inches.	Inside measurement. feet. inches.
A to B 1 3 $\frac{7}{8}$ 1 2 $\frac{5}{8}$		
B to C { 2 1 $\frac{1}{2}$ at top. ... 2 0 $\frac{7}{8}$		
B to D (depth) 0 1 $\frac{1}{2}$ 0 1 $\frac{1}{8}$		

* There are very few things that will not go into D; and I would advise that no drawer of E depth be ordered until the necessity for it is proved.

FIG. 4

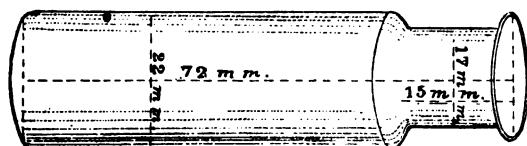


FIG. 2

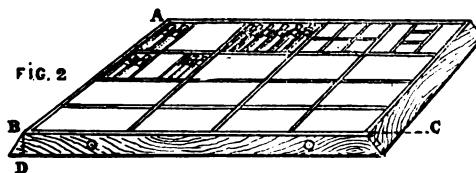


FIG.5

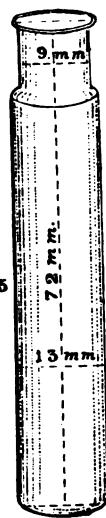


FIG.1

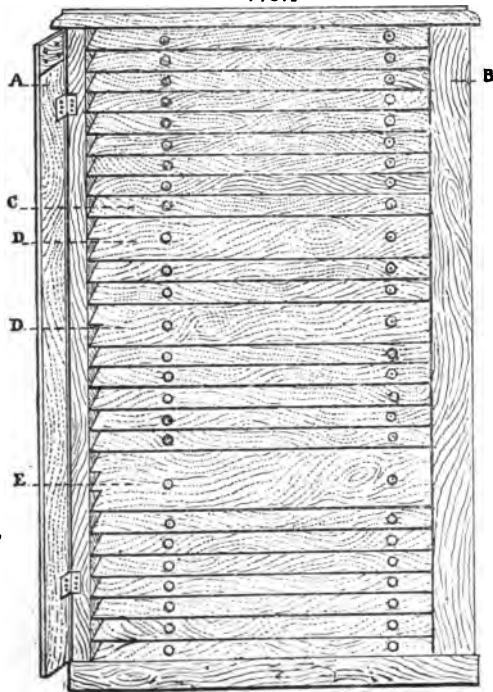
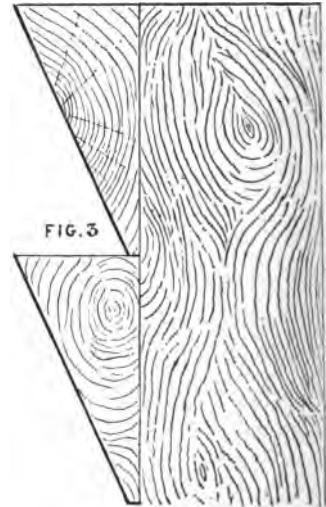


FIG.3



The precise depth of this shallow drawer is very important as it exactly takes in the larger bottles and boxes. It will be observed that the outside of the drawer is wider below than above forming a jutting process which fits into the groove at the side of the cabinet on which the drawer rests. Fig. 3 represents the triangular supports which form the grooves of their full size, they of course are of the whole depth of the cabinets, and each is a separate piece glued and nailed to the side of the cabinet. The double depth drawer occupies two grooves; the treble depth three grooves. (Fig. 1, D and E.)

The advantage of this will be at once apparent. (a) No partition separates the drawers, each drawer forming the cover of the one below, so that no room whatever is lost. (b) a deeper drawer can be inserted in any situation required, (c) if one part of the cabinet is crowded with specimens and more space is required, no re-arrangement is necessary, one or more drawers are taken from the bottom (to be removed to the top of the succeeding cabinet), the remaining drawers are moved downwards, and the additional drawer or drawers inserted in the place or places required—the whole being done in a few minutes.

Each of the shallow drawers* is provided with a wooden framework, which divides the drawer into sixteen divisions, each measuring 6 inches by $3\frac{1}{2}$ inches, this frame I prefer to be loose so that it can be taken out if desired; its use prevents the contents of the drawers slipping about from one part to another (Fig. 2.). The drawers as used by me have no glass covers, and if it is desired to have these they must of course be proportionately deepened.

* Not the deeper drawers.

In these drawers glass topped boxes, trays, tubes (for dry things), bottles (for spirit preserved animals), are employed promiscuously. The glass topped boxes and open trays are of the same dimensions as follows :

	Inches.	Inches.
Size 1	$3\frac{1}{2}$	$3\frac{6}{10}$
„ 2	$1\frac{1}{2}$	$3\frac{6}{10}$
„ 3	$1\frac{1}{2}$	$1\frac{3}{10}$
„ 4	$1\frac{1}{2}$	$1\frac{2}{10}$

} all one inch in
} depth.

2, 3, and 4 being, as will be seen, one half, one fourth, and one sixth of the size of 1 respectively.*

In the deeper drawers larger sized trays are employed which are two, four, or six times as large as size 1.

The sizes of the tubes employed are

Largest 75 millims by 18 millims.

Second 75 „ 14 „

Third 75 „ 8 „

The Tubes are chiefly used for the smaller shells.

The dimensions of the two sizes of bottles are given on figures 4 and 5 which represent them.† The very best corks should be used, and then it will be found necessary to reject a large proportion of those supplied as not being sufficiently good. It is better to throw away a whole gross of corks, than by the use of a bad cork to have a valuable specimen destroyed.‡

* My glass topped boxes are made for me by Mr. Hugh Fulton,
216, King's Road, S.W.

† The dimensions of tubes and bottles are given in millemeters as I procure them from Germany, from Gundlach and Müller, Ottensen bei Hamburg. For bottle 4, I pay £2 10 per thousand, and for bottle 5, £1 10 per thousand.

‡ For small bottles corks are a much more secure closing than ordinary glass stoppers. I have not had much experience with gutta-percha stoppers; they are, at any rate, very good for a time.

In fig. 2 the first five compartments are represented as filled to show the intermingled use of boxes and bottles. Compartment the first contains two of the larger bottles and box size 1; the second, six larger bottles; the third, six boxes size 3; the fourth, box size 2, three boxes size 3, box size 2; the fifth, two larger bottles, box size 2, and three smaller bottles.

In arranging the cabinet, the twelve compartments to the left of each drawer are usually filled, and the four compartments on the right left empty for future acquisitions, when the drawer becomes full an empty drawer can be inserted, as has been already described.

The optional use of boxes, trays, tubes, and bottles enables the whole collection to be scientifically arranged, so that any species required is at once found.

The larger bottles from the width of the mouth will afford room for much larger things than might be supposed. Thus to take the Crustacea as an example. They will hold such smaller Brachyura as *Pinnotheres*, *Ebalia*, &c., the smaller *Paguridæ*, most of the Macrura, the whole of the Mysidea, Cumacea, Isopoda except of the larger species of *Æga*; Amphipoda except *Euryporcia gryllus*; and all the lower Crustacea except the larger species of *Pennella* and the larger *Cirripedia*; and one of these cabinets will contain more than four thousand bottles of such Crustacea.

It is advisable once or twice in the year to go through the drawers which contain bottles. Each drawer is taken out and slightly tilted, when any bottle that shows deficiency of spirit is at once detected; the bottle is filled up and, if necessary, a new cork used.

A NEW PRESERVATIVE FLUID.

By E. M. HOLMES, F.L.S.

DURING the last two or three years, a powerful preservative, disinfectant, and deodorant, has been introduced, under the name of Formalin or Formol, to the notice of the medical profession. Still more recently it has been recommended for the preservation of Museum specimens of both plants and animals. My own experience with this new fluid is comparatively small, but I have ventured, nevertheless, to direct the attention of the Members of this Association to its known and possible advantages, as it does not appear to be so well known as it deserves. Those present who may have experimented with it, will, I trust, add the results of their experience to the little I here contribute.

A brief notice of its properties and the uses to which it has already been put may be useful to those who are still unacquainted with it.

Formalin consists of a 40 per cent. aqueous solution of formic aldehyde. This body is a gas obtained by the action of atmospheric air on methylic alcohol in presence of red-hot platinum wire. There are several other methods by which it can be prepared, and there is little doubt that if a large demand should arise, it could be supplied at a much cheaper rate than hitherto. Up to the present its price is about equal to that of methylated

spirit. The 40 per cent. solution is the strongest that can be made to keep satisfactorily. If made of a greater strength the aldehyde is liable to polymerize and to be deposited in the form of a white, solid substance, known as paraformic aldehyde. This peculiarity may, however, in all probability be taken advantage of to supply formic aldehyde in a more portable form for the use of travellers in hot countries, since when the paraformic aldehyde is boiled in a sufficient quantity of water in a flask it becomes re-converted into the normal formic aldehyde.

At ordinary temperature formalin gives off the vapour of formic aldehyde to a sufficient degree to cause some irritation to the mucous membrane of the nose when inhaled. In a room where the strong solution has been used, all traces of the vapour may be removed by sprinkling a little ammonia about, when an inodorous substance, hexamethylamine, is formed. As formic aldehyde oxidises slowly into formic acid when exposed to the air, substances preserved in it should be kept in closed vessels.

For preserving vegetable products a solution containing about 1·2 per cent. of formic aldehyde has been found to answer the purpose. As $2\frac{1}{2}$ parts of formalin contain one of formic aldehyde this quantity may be added to $97\frac{1}{2}$ parts of water to form the one per cent. solution, or to $47\frac{1}{2}$ parts to form the two per cent. solution, and so on. Professor Moebius found that histological specimens which had been preserved in formalin for 11 months still showed the cell membrane and contents, including the position of the chlorophyll grains and nuclei quite as well as fresh preparations. It is evident therefore that it can be used with advantage for preserving microscopical preparations of plants.

In my own experience I have found that the solution answers well for some plants, but is not quite strong

enough for others. In some, such as the Juniper, very little of the appearance of the fresh plant is lost, even the waxy bloom on the fruit and leaves being preserved, but in others, such as the Henbane, although the leaves do not lose their green colour, the flowers lose a little of their beauty ; the purple veins becoming somewhat indistinct, and in some fruits, such as the hips of the wild rose, the colour loses a little of its brightness, but in no case is the colouring matter dissolved as it would be by spirit of wine. The odour of the plants is also well preserved and quite distinguishable after the lapse of months. Further experiments as to the best strength to use in different cases is still needed.

It is stated that fish and small animals can be preserved for an indefinite period in the 40 per cent. solution, even the iridescent appearance of the scales and skin being preserved as in life. I have had no experience with animal substances myself, but Dr. H. O. Forbes informs me that it succeeds admirably in many cases, although not with crustaceans. This would probably depend on the gradual development of Formic Acid which would dissolve out the lime producing Formate of Calcium which is soluble in water, but insoluble in alcohol.

One of the most remarkable properties of formic aldehyde is its action upon gelatine. After about a 24 hours exposure to the vapours of a 40 per cent. solution, gelatine not only becomes insoluble in water but it loses its property of melting when heated, so that even when placed in the flame of a Bunsen burner it only chars but does not melt. Although rendered insoluble in water, it does not lose its transparency. This property has been turned to account in the preservation of cultivations of bacteria in nutrient gelatine for biological specimens. The only precaution necessary is in the case of those

bacteria which rapidly liquify gelatine, when the use of formalin must take place sufficiently early to prevent the loss of the characteristic form of growth of these species.

It has also a peculiar effect upon the skin of animals. It has been found that repeated applications of the 40 per cent. solution to the ear of a living rabbit caused the part to dry up and form a substance resembling papier maché which ultimately fell off without causing any bleeding. Whether or no it could be utilised for the preparation of skins of birds and animals yet remains to be seen.

It does not appear to interfere with the staining of tissues with aniline dyes, and therefore from its action on gelatine it is evident that it might prove very valuable for preserving microscopic slides mounted in gelatine. It must, however, be borne in mind that formic aldehyde is a powerful reducing agent and that such staining re-agents as are easily deoxidised might be affected by it. The colouring matter of blood, for instance, is stated to become of a brown colour.

Although it kills bacteria and prevents their growth, it does not seem to prevent the growth of moulds to the same extent, when these are not dependent on gelatine for their growth.

I have not enumerated the various applications that have been made of this new substance in medicine and sanitary science, but I may mention that as a deodorizer, its use in making animal dissections and preparations will be found very valuable, although it would not be desirable to expose the skin of the hands too long to the action of the concentrated solution. A one per cent. solution answers well for deodorizing purposes.

DR. H. O. FORBES (Liverpool) then exhibited a number of specimens in the new preservative, and made the following remarks in its use. The first specimens which I show you are medusoid forms, which have retained their forms and transparency with the utmost perfection. They have only been in the preparation for three or four months. It is impossible, therefore, to speak of the experiments as more than tentative, but they give great hope for the future. I found in preparing the preservative for marine specimens that it is better to use a salt water than a fresh water solution, while for fresh water objects, a fresh water solution should be used. When transferred alive direct from the sea into a salt water solution there is less absorption or taking out of the colour, than in a fresh water one. In the specimens I exhibit there is, as will be observed, scarcely any loss of colour. It is possible that there may be loss of colour from exposure to light. Everything loses its colour when exposed to the light, and I do not think this will be any exception to the rule. The specimens I show you may be a little duller than natural, but some of these medusoids and some of the marine fishes have certainly not lost any of their brilliancy. Some of these fishes (flat fishes and *Centronotus*), which were transferred alive direct from the dredge into the solution, have preserved their colour and retained their natural appearance perhaps better than those which had been dead for a short time before being immersed in the formol. Such forms as contract by the effects of removal from the sea, such as anemones, alcyonaria tubularia, &c., are first put into a dish until they expand, where they are paralyzed by the gradual addition to the water of cocaine and then transferred to the formol. My experience with regard to plants has been very small. Specimens of primrose which had been

in the new preservative, and in a very weak solution—the actual strength I do not know—for six or eight weeks, looked quite as perfect as when plucked, but whether they will keep permanently I do not yet know. With many plants I have succeeded by using a weak solution of formol, while with others it has quite failed. I have also made some experiments, of the results of which I am not able to speak yet, by putting the 40 per cent. formol—the substance as it is purchased in the market—into the bottom of a bottle and into which the roots of the plant are set, and the bottle closely corked up. I think it may be possible that the vapour from the formic aldehyde will be sufficient to perfectly preserve certain plants without immersion in the solution. So far it has proved successful, but how long it may be so I am unable, of course, to say. Everything with regard to formol is at present in an experimental stage. For gelatinous objects it would appear that it is the only medium at all successful. Shells and crustaceans appear to suffer in formalin solution, as the calcareous portions in their structures appear to dissolve out, and so far it has not been equally successful in this direction ; in sea water, however, the solvent effect of the formol on calcareous structures has been less than in a fresh water solution.

THE PRESIDENT spoke in high terms of the new preservative, and of the trouble it would save in preparation. It was a source of annoyance having to use more than one preservative. Those specimens shown in the formalin were better than he had ever seen in any other solution. They quite equalled if they did not surpass those that came from Naples, and one marked characteristic of the specimens exhibited was the retention of colour. With respect to the destruction of calcareous matter, the President said they must not assume it was the formalin's action. It was quite possible some other cause might change the specimen. It would be

interesting to have these specimens examined to see what change had taken place in them, so that we might be guided in future.

PROFESSOR POTTER (Newcastle) showed a number of specimens preserved in five different media—fomalin, 50 per cent. of alcohol, 5 per cent. of zinc chloride, strong glycerine, and a strong solution of common salt.

MR. PLATNAUER asked Mr. Holmes if the new preservative was neutral. Its attack on the calcareous specimens Dr. Forbes had put into it seemed to point to the fact that it might be somewhat acid. Could an alkaline carbonate be safely added? He desired to know if cold would produce the polymer of formalin that Mr. Holmes spoke of. He believed certain alterations of temperature were apt to produce formic acid.

MR. HOLMES said the preservative might become slightly acid when the vessel was not full. He could not say whether or no neutralization with alkaline carbonate would injure the structures they proposed to place in it. Formalin could be used for some things with advantage, but he did not profess it to be a general preservative. It was very useful in those cases in which methylated spirits dissolved out colouring matters.

MR. PLATNAUER pointed to the fact that there was a danger arising from the formation of acid, and the question was whether any means could be adopted to prevent oxidation of formalin. Could not the solution be reduced where they had calcareous specimens to deal with?

MR. WHITE thought it would be of great advantage, in every case, if the strength of the preservative was noted at the bottom of the jar for future use.

ON THE UTILITY OF PLASTER CASTS IN
COLLECTIONS OF PREHISTORIC
ANTIQUITIES.

By F. W. RUDLER, F.G.S.

Memb. Anthropol. Inst. and R. Archæolog. Inst.

HAVING had occasion during last spring, to deliver, for the London Society for the extension of University Teaching, two courses of lectures on Prehistoric Archæology, my attention was directed to the best means of obtaining specimens for the illustration of such a subject. My private collection of prehistoric antiquities was not large—nor indeed is it generally desirable that Curators should possess private collections of value ;—but about fifteen years ago I had purchased from M. Eugène Boban, of Paris, a number of plaster casts representing various implements and ornaments in stone, bone and bronze. Many of these I had given away, but such as remained I used in illustration of the lectures, and was pleased to notice how highly they were appreciated by my class, the common opinion being that for all practical purposes they were “as good as the originals.”

Such being their utility it seems strange that greater use is not made of similar objects in our Museums ; and I therefore now beg to exhibit a few of these casts to the

meeting in order to direct the attention of Curators to their educational value. It is true that we find occasional examples of casts of prehistoric antiquities in our public collections, but they are generally neither numerous nor important, and are introduced casually rather than systematically. At any rate we avail ourselves of these ready means of instruction much less freely than is done in certain continental Museums.

For example, there was established in Mayence, as far back as 1853, a Museum which sought to exhibit casts of all the characteristic antiquities of Germany, from the remotest prehistoric periods to the time of Charlemagne. This institution is known as the *Römisch-Germanische Central Museum*. All the public Museums and important private collections of Germany were ransacked for suitable specimens; the finest examples were selected, and beautiful facsimiles fabricated. While the originals remained scattered far and wide, and were often inaccessible to the public, the casts preserved in this Central Museum gave the student an opportunity of seeing in a single collection, of moderate compass, all the choicest archæological treasures of the Fatherland. I have not been in Mayence for many years, but when last there I had an opportunity of visiting the workshop attached to the Museum where the plaster casts were fabricated. The moulds having been made, casts of many of the objects were offered for sale at moderate prices; but, so far as I know, very few Museums in this country ever availed themselves of the opportunity of purchase.

Nearly all our Museums possess certain prehistoric antiquities of local occurrence, and it would be, in most cases, an easy and safe operation to make moulds of these objects. Small antiquities in stone, such as flint celts and stone hammers, especially lend themselves to this

treatment, and even metal objects may often be effectively copied, as witnessed by the re-productions of bronze implements now exhibited. Once possessed of the moulds, it becomes an easy thing to produce casts for sale, or exchange with other Museums, or with private collectors. Original specimens, figured in Archæological journals or in standard treatises like those of Sir John Evans and Canon Greenwell, might in this way be copied, and the casts advantageously distributed through the Museums of our country.

I would suggest that lists might be published, from time to time, in the Reports of this Association, giving a brief description of such casts as could be supplied, with their prices. Probably it would be most convenient to arrange, for the production and sale of the casts, with some professional modeller in the town where the Museum or collection is located ; but I hold it as important that they should be issued under the superintendence of the Curator or the owner, in order to give the purchaser an assurance of their accuracy.

That these casts may be worthy of exhibition in a public Museum they must be made and coloured with great care, being made as far as possible facsimiles of the originals. In some Museums we see untinted casts, looking like copies carved in chalk ; giving it is true the shape of the object, but conveying no notion of its other characters. For the purpose of tinting the casts, water colour will probably be usually found better than oil : in fact, oil paint generally gives a coarse varnished appearance to the object, which is in most cases quite unnatural. The coloured cast should be soaked in melted stearine, or some similar medium, which will fill up the pores, and give to the object a superficial appearance of solidity. That it is not difficult to produce satisfactory

casts may be inferred from my own experience ; for, in order to determine whether the method was difficult, I made one cast experimentally, which I now exhibit, as illustrative of a first attempt at such work.

No part of a Museum ought to be more generally interesting than its prehistoric department. Forming a connecting link between the geological collections and those of early historical antiquities, it should obviously appeal both to the naturalist and to the historian. Most intelligent people, even without strict scientific training, find peculiar fascination in a collection of prehistoric objects ; but in order to make them spell out their own story they must be arranged in sequence, so as to illustrate the evolution of culture. A Museum may possess certain local antiquities of priceless worth, but if they stand isolated the casual visitor will probably fail to realize their value. The antiquities to be properly appreciated should be arranged in a regular chronological series, shewing the development of civilization. But as few Museums can possess a systematic series of original specimens, it becomes desirable to supply the deficiencies by means of plaster casts.

I am, of course, well aware that casts are commonly in use in our Museums, not only for illustrating classical art, but for natural history purposes, notably in palæontological collections. All I desire to do in this brief note is to advocate a more generous, and especially a systematic, use of casts in one particular department of study,—a department in which they seem to me to be greatly needed, and where they are likely to prove pre-eminently helpful.

MUSEUM LIBRARIES.

By WILLIAM WHITE, OF THE RUSKIN MUSEUM.

IN the Presidential Address delivered by the late Mr. H. H. Higgins at the Annual Meeting of this Association, held at Liverpool in 1890, special attention was drawn by him to the method adopted by Professor Ruskin in his Museum, at Sheffield, of representing vertebrate animals of some orders, more especially birds, by means of fine hand-coloured engravings and water-colour drawings, instead of the frequently unnatural stuffed skins. It is scarcely necessary for me to repeat here what was then so well observed by that worthy enthusiast in the cause of Museums, whose loss to the Association we have still to deplore, nor yet to more than refer to some remarks on the subject which were included in the paper* I read at our London meeting only two years ago. These are already available for reference in the Annual Reports published by the Association. I have thought, however, that it would be well to enlarge somewhat upon what appears to me to be absolutely necessary as an adjunct to a properly equipped Museum, and to offer some suggestions relative to the constitution and development of Museum Libraries.

*“The Function of Museums as considered by Mr. Ruskin.”

In the first place, it must be observed, however, that neither I nor Mr. Ruskin propose, as might appear, to deprecate or to ignore the value of really well-mounted specimens when they faithfully represent the living forms of the animals or plants, such as we see in the delightful series of valuable, but costly, cases of birds and their surroundings in the galleries of the British Museum. Mr. Ruskin, indeed, acquired for his own Museum an extensive collection of bird-skins, recognizing the fact that for scientific purposes birds are best kept in this state, in drawers, and which series he subsequently decided to transfer to the British Museum collection. It was his intention to also provide a series of the skins of snakes, but this purpose was not accomplished.

With regard to plants, it is at present quite hopeless to attempt any representation of their living forms, and exquisite structure, by means of their shrivelled and crushed remains. They, and other such delicate organisms, can be fairly represented by the highly-trained skill of true artists; but *properly* only by those of such exceptional genius as belongs to few. This remark naturally applies with equal force to the work of those who attempt the preparation and artistic mounting of natural history objects of all kinds.

Now, as the studious examination of birds is best attained by dealing with the skins in their pliable, unmounted condition, when the wing, tail, and other feathers can be thoroughly handled, so their study may further be best pursued in the convenient form of flat representations upon stout paper, especially if kept loose in the portfolio form. The different specific forms may then be most readily studied comparatively and interchangeably, at a glance, and classified in a manner that admits of any variation that may from time to time be

found necessary, while such analysis of the genera, and diagnosis of varieties as occur in different collections can with great advantage be introduced, as is impossible under the methods of exhibiting the specimens themselves still generally adopted in Museums. In every case the active life and habits of the animal or bird should be specially depicted, as observable in the field by the ordinary visitor. The aid of the faculties of the best artists may thus be called in, combining the applied study of art and nature to such an extent as is at present unknown. No collection of natural history specimens alone, however beautifully mounted, is of real adequate service to the scientific student unless accompanied by artistic drawings, or engravings, of the chief features and details which are special to the class to which each belongs. Valuable as dissections may become if the parts are treated diagrammatically, they are too often, instead, strangely deceptive. The parched and distorted dead tissues of so many of the anatomical preparations that are generally to be seen, completely metamorphosed by the processes of preservation (erroneously so called), instead of representing the qualities of the organism when it is alive, and which we naturally look for, become actually a *hindrance* to the true understanding of the functions which the several parts perform.

The necessity of having the various authorities and works of reference close at hand, was found by the British Museum staff, on the removal of the Natural History Collection from the precincts of the Library at Bloomsbury to Cromwell Road, to be a very great difficulty ; and, although it was some years before it could be achieved, a separate Library had to be formed,—chiefly, I believe, by means of transferring many of the volumes relating to the subject from the attached Library at Bloomsbury to South

Kensington. The Arts Museum at South Kensington, and the Jermyn Street Museum have long had their own Libraries, which are so essentially a part of the collections that they would be incomplete without them, and, indeed, I do not know how they could *exist* without them. It is, however, most unfortunately the case that the Curators of most of our Provincial Museums are at a more or less complete loss for the means of properly dealing with the collections which it is their business to arrange ; and, in only too many instances, the deficiency of the Library that he needs has to be provided at the private expense of the Curator himself, without anybody knowing anything about it. In some towns, it is true, the Public Library is fortunately situated adjoining the Museum ; yet, again, in these cases, how rarely it occurs that the works needed are contained therein ! Sometimes, perhaps, the Curator may privately arrange for the loan of some special work he requires from the Reference Library, to be returned when asked for, or from some friend whom he carefully avoids meeting for a time. But all these and similar difficulties would be overcome, with great advantage to everybody, if a Departmental Library of all scientific, and any other works of a specialist kind distinctly relating to the collections contained in the Museum, were formed systematically and duly recognized as a part of the Institution, and to which students would have recourse, to study the authoritative works in connection with the specimens.

I can foresee no objections of any kind to this plan. It might, perhaps, involve the transfer of the volumes required from the Reference Department of the Public Library to a room in the Museum building, with one of the staff to look after it. There might, perhaps, be among the members of committee some who would attempt to

raise a jealous rancour over the parting with some of the property they for the time being possess control over,—solely for the benefit of some other department. But it is the benefit of the general public that we have to consider; and as the course I am advocating would lead at once to increasing the number of scientific works—and of their readers—which are generally very deficient, the advantage of the course would undoubtedly be very great. I conceive that most of the Librarians themselves would not be sorry to be rid of works of this technical character, and which are rarely if ever enquired for at present. Everyone would know where to go for what he needed, and would at once experience the benefit conferred by the removal of such works from their shelves.

Steps are now being taken by means of our Association to obtain for use in our Museums the publications of the Geological Survey. This is a step in the right direction, and I think there need be no doubt that if it became known that such special Libraries were being formed, many similar publishing bodies, such as the extremely liberal Smithsonian Institute—not to mention authors themselves, and why not the learned Societies?—would help by contributing towards so excellent an object. I do not think, however, that we should wish to make the furnishing of the shelves of our Museum Libraries a matter of charity; although we are, of course, always grateful enough to donors for their kind and helpful consideration. The Museum Library should be treated by those in authority as just as necessary a part of the provision of the Museum outfit as the cases in which the specimens are shown.

The suggestion has now very frequently been made, which is happily also being acted upon in some Museums, that drawings and engravings should be introduced into

the cases, side by side with the specimens, to help to explain them. Nothing can be better in all these directions with the object of creating the ideal Museum which Sir William Flower has frequently described so felicitously. I only seek to urge the matter still further. I would suggest that the local Museum of the future should be chiefly an Index Museum, somewhat of the type adopted at South Kensington, but with a difference of course. Typical examples of each group *only* should be exhibited to the public at large, the bulk of the collection being kept in drawers for the use of students, in connection with the descriptive works contained in the Library. Against each type example brief reference should be given both to the authorities to be read, and the studies of the details that are kept in the Library Department of the Museum. This, I am aware, involves much; but it is labour of precisely the kind that we feel is what is so greatly needed, which we ourselves greatly desire to be accomplished, and which we ourselves may greatly assist in accomplishing.

THE PRESIDENT, commenting upon the papers, said there was nothing more necessary than a Library for Curators. But to provide anything like a satisfactory General Natural History Library the sum of £10,000 or £12,000 would be required. A great deal, however, could be done by getting the larger and more important works which were now published. He would make a suggestion in connection with Mr. Rudler's paper as to the desirability of illustrating very fine species and forms by drawings. The time occupied and the skill required for the execution of original drawings to illustrate animals is, of course, very great. He could not help thinking that this Association would be wise if the members combined to obtain in some measure the advantage spoken of, namely, the illustration by figures of such forms of animal and vegetable life, as, for various reasons, cannot be represented by specimens. If thirty Museums subscribed a guinea each, there would be thirty guineas to lay out in the purchase of well illustrated standard works, the plates of which would be cut out and divided among the subscribers; and the letterpress of the several works

might then either be sold to the highest bidder among the subscribers or in some other way disposed of. [At the meeting I mentioned forty subscribers of one guinea each. Further consideration leads me to suggest thirty subscribers, as few books supply Plates enough to divide by forty.] The following list of Works is suggested for the purpose named :—

	£ s. d.
Faxon, Embryological Monographs : <i>Crustacea</i> —3 copies at 12/- each	1 17 6
G. O. Sars' Norges Ferskvandskrebsdyr, Branchiopoda—8 copies at 5/- each	2 0 0
G. S. Brady, Challenger Report Ostracoda	0 18 0
Claus, Die frei-lebenden Copepoden	0 17 0
Steenstrup and Lütken, Bidrag til Kundskab om det abnæ Havs Snyltekrebs og Lernæer—2 copies at 8/- each	0 16 0
Hudson and Gosse, The Rotifera	4 4 0
A. Agassiz, Embryological Monographs, <i>Echinoderms</i> —3 copies at 12/- each	1 17 6
Fewkes and Mark: Embryological Monographs, <i>Acalephs and Polyps</i> , 3 copies at 12/- each..	1 17 6
Hincks, History British Hydrozoan Zoophytes	2 2 0
Haeckel, Challenger Report, Siphonophora—2 copies at 31/-..	3 3 0
Bowerbank Anatomy and Physiology of Spongiadæ, 3 Pts, 1859—62—2 copies at 10/- each	1 1 0
Brady, H. B., Challenger Report, Foraminifera	3 3 0
Leidy Freshwater Rhizopods of N. America	1 15 6
Hertwig, Organismus des Radiolarien—3 copies at 19/- each	2 17 0
Salville Kent : Manual of the Infusoria..	4 4 0
	<hr/> £32 12 6

I thank Miss Phipson very much indeed for her interesting suggestion: it is well worthy of consideration. It is extremely desirable that this Association should have a volume which should contain records of all important collections possessed by each Museum, especially of any important type collections or type specimens. Such a record would not take more than a page for each Museum, and would enable Naturalists to find at once where any particular collection was to be found. With regard to the collection of casts, it is scarcely one of very great difficulty, and I have little doubt men could be found in some of our own Museums or towns who would execute those casts after a little practice with great skill.

Miss E. PHIPSON said : I have great hesitation in rising upon this occasion, being only an outsider, an associate, and without much practical knowledge of Museums. But perhaps the suggestion I wish to make comes better from an outsider, because as such I feel the need of what I am about to propose. That is that this Association should undertake the publication of a Guide to Museums. I know it is rather a large order, covering as it would do the Museums of the world. But in these days of specialists—almost everyone interested in science *is* a specialist—people wish to know where they can refer for information on any special branch of knowledge. This proposed guide should be mainly, I think, a classified index with a short description of the various Museums. With the aid of such an index we could ascertain at once where particular objects are best to be found and much time would thus be saved. Every year we have in our Reports interesting accounts of Museums in different parts of the country. Last year we had a notice of the Irish Museums and a long paper on Colonial Museums ; but this is a slow process, and does not benefit the general public. These accounts are very noticeable, but they need to be put together in a practical shape. There would be another advantage from such a guide. People who had collections by them which they could not accommodate, or which they would like to present to some Museum, could refer to this book and see where such collections would be best appreciated. The existence of this Association would also become better known by means of such a guide. "Where is your public ?" you may ask. "How would you make it pay ?" If it were published in a cheap form by one of the guide book publishers, and I do not think it should be a very expensive book, it would have a very large circulation. It would be sold at every Museum throughout the world, and that alone would ensure a good sale ! I do not quite know how it is to be done. But I think if the Council would take it into consideration they might easily manage it. They are in touch with all the Museums and have access to all their catalogues. My brother-in-law in India is the Founder and Hon. Secretary of the Natural History Museum in Bombay. I wrote to him asking for particulars of the Indian Museums. He replied as follows :—"I am very glad to hear that you are about to advocate the production of a 'Guide to the Museums of the world,' as the necessity for such a thing is becoming more apparent every year. The Museums in India are in many respects in a very backward state, as is shown by the fact that such a body as the 'Bombay Natural History Society' should find the necessity of possessing a Museum of its own. Our Museum is not open to the public and receives no support from Government, but has been formed by the co-operation of members of the Society, now 830 in number. The collections are restricted to specimens from the oriental regions. Its strongest point is the Dandergne Collection of Cashmere Heads, and I may add, without boasting, that the collection of reptiles is very valuable. The *Government Museum in Calcutta* is particularly rich in specimens of deep sea fauna, being annually supplied by the dredgings of the 'Investigator' (S.S.), which has, for some years past,

been engaged in taking soundings in the Bay of Bengal for the Indian Government. The *Madras Museum* has, under its present able superintendent, become possessed of many valuable specimens of marine zoology. The *Bombay Branch* of the *Royal Asiatic Society* has, in its Museum, many things of the greatest archaeological value, which ought to be better known : and every historian who visits India ought to see the beautiful collection of Indo-Greek relics brought together at the *Lahore Museum* by Mr. Kipling, senr., demonstrating the wonderful influence left by Alexander the Great on the banks of the Indus. But without a *Guide Book to the Museums of the World* who knows of these things ? "

MR. PLATNAUER said he would have a few casts as a collection by themselves. He would not mix them in with the general collection. A collection of casts known to be casts might be extremely useful, and they would not deceive anyone. They might distribute a few real articles among them as actual types of the material. That would teach the texture, and a series of casts in proper order would teach the student the general look and form, so that by the time he got both of these into his head he would be fairly well up in his subject. Having referred to a collection of casts of coins, which were in little square cases and labelled "Casts of Coins," Mr. Platnauer said the casts in this instance were so excellent that they might easily have deceived anybody. But, he pointed out, in the case of coins, casts would be of extreme utility. If they exhibited an ordinary collection of coins very often most would be only moderate specimens. But if they exhibited a series of casts they could get models of the best preserved so that in putting the casts before their visitor they gave him a specimen of the very best. He distinctly thought there was a place for casts, though at the same time he had sentimental objections to having shams among real specimens. The greater the truth the greater the belief, and so the better the cast the more thorough would be the imposition.

MR. HOYLE said : If a cast is so good as to deceive the individual who is examining it, for him it was as good as the original. I will make this practical suggestion : If any of you have in your museums casts of such excellence you had better label them with the word "Casts" in conspicuous type, because it prevents their being stolen.

MR. HOLMES referred to the importance of distributing copies of type specimens of plants, and mentioned that Dr. G. Watt, of Calcutta, had utilised photography for the purpose of taking back from Kew Herbarium photographs of the type specimens of plants that exist there. This plan might be extended with great benefit to Museums.

ON THE ARRANGEMENT OF A GEOLOGICAL MUSEUM.

BY HERBERT BOLTON, F.R.S.E.

Assistant Keeper, Manchester Museum, Owens College.

GEOLGY, as represented in our Museums, is, I believe one of the most uninteresting and least useful of the sciences.

The collections consist almost entirely of rocks and fossils arranged row upon row, all correctly named may be, but destitute of any attempt at an explanation of their nature, mode of occurrence, or origin.

Again, few fossils are naturally attractive or lend themselves to display, and not unfrequently they are unavoidably fragmentary.

It naturally follows, that to the great bulk of visitors, there is very little which appeals to their general knowledge, and even to the student, the geology of a Museum is a difficult study. If he has come with a few specimens to identify, he is bewildered by the large number of fossils displayed, and very probably goes away after a vain attempt to distinguish any like his own. If we consider how we should *teach* the subject of Geology if we were called upon to do so, we shall I think find a clue to the true method of dealing with our collections.

In teaching the subject we should first deal with physical geology, and devote considerable attention to a clear exposition of the various agencies which operate upon the earth, and of the results of those agencies, and it would only be at the last that we should treat of fossils and of those successive eras of time which are called "Systems."

Here it is that we have failed, we have not attempted to deal with physical geology, and there is nothing in our Museums which leads up to and explains the series of rocks and fossils.

When we realise that rocks and fossils are but part evidence of the story of the earth, and when we strive to make that story continuous and complete in our cases, then I think we shall witness an increased attention on the part of the public, and a wider sphere of usefulness.

Our collections must be such as would satisfy the needs of a lecturer, and we must supply his place by a number of explanatory labels.

The lines upon which I consider that a Geological Museum ought to be developed have already been put to the proof in some degree, and there is no question of their feasibility or utility.

Some ten or a dozen years ago, Prof. W. Boyd Dawkins initiated a "Group System" in the Geological Department of the Manchester Museum, which has had the happiest results. The main group is one which deals with the mode of action and results of various denuding agents, and specimens are shown which illustrate the action of water, of carbonic acid, moving ice, etc., etc.

This is accompanied by groups which illustrate the main facts of fossilisation, of organically-formed rocks, and others.

I can speak from personal experience of the value of these groups to the student, and also as arresting and commanding the attention of visitors. I have made it a rule to draw the attention of Science Classes visiting the Museum, to these groups, and have again and again made the larger group the subject of informal lectures to students. I do not think it is exaggeration to say that this group has done more than all our fossils in assisting students in their study of the science.

But in this paper I would urge a considerable extension beyond anything which has yet been done at Manchester. I would plead for an almost entire reconstruction of our Geological Museums, for a reduction in the number of fossils and rocks exhibited in our cases, and for the development of a section designed to demonstrate all the main principles and facts of geological science.

I am inclined to think that not more than one third of the whole space available for Geology ought to be occupied by a stratigraphical series, the remaining two-thirds being taken up with groups illustrative of physical processes, &c., and that, throughout, every care should be taken to make each case or cabinet, a unit of one continuous series. It would not be seemly that I should call in question our present arrangements if I was not prepared to suggest something else, and I therefore hasten to lay before you the outline of a general plan which I think could be adopted with advantage in any Museum aiming at a useful Geological section.

I cannot attempt to discuss in all its fulness, the plan which I present to you, time and patience would alike fail. What I purpose to do is to show in a general fashion how the various divisions can be developed, and indicate a few of the sources from which material can be drawn.

- I. *Cosmical Geology.
- II. Physiographical Geology.
- III. Petrographical Geology.
- IV. Life Features of Crust.
- V. Stratigraphical Geology.
- VI. Palæontological Geology.
- VII. Historical Geology.

You will notice that I have made seven chief divisions of geology, all of which are in a measure dependent upon one another, but yet can be developed separately.

SECTION I.—COSMICAL GEOLOGY.

This division deals with the relation of our Earth to the other members of the solar system, and whilst it is not one upon the retention of which I should care to insist too strongly, it could be made very useful, and is I think in some measure necessary as a starting point.

SECTION II.—PHYSIOGRAPHICAL GEOLOGY.

I do not remember having seen this section dealt with in any Museum, yet it is of surpassing interest, and could easily be made a most effective agent in making plain the destructive and constructive action of physical agents, and of organisms.

The wealth of material awaiting our use for this division almost passes belief. I need only mention the admirable maps of geographers; the beautiful models of glaciers and volcanoes constructed by Dr. Heim of Zurich; the working models of geysers; and the varied and abundant materials supplied by the work of such exploring ships as the "Challenger" and others, and most of all, the photographs which can everywhere be

* For chief sub-division refer to page 63.



PHOTOGRAPHS ILLUSTRATING THE ACTION OF MARINE
DENUDING AGENTS.

(Re-produced by kind permission of the Belfast and Northern Counties Railway Company.)

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obtained to illustrate almost anything. Let me here instance those of Mr. R. Welch, of Belfast, which have been taken specially with a view to their adoption in Geological Museums and classes.

If I may instance one out of the many points which can be dealt with under this section, it will be that of "Rivers and their Action."

I will briefly describe how any particular river might be dealt with to illustrate Geological processes.

The *General Features* of a river could all be effectively displayed on a map, for example an ordnance map. The length and direction, the drainage area or catchment basin, the water-partings separating it from other river basins, could all be indicated by colour, as could also the rainfall. The volume of water might be stated in figures.

Springs and tributaries could be marked in with the pen, whilst the nature of the landsurface, hill and valley, could be shown either by a contoured map on which the contours had been accentuated, by the use of a relief map, or one with hill engraving.

Photographs would go far to convey a clear knowledge of such physical features as waterfalls, ravines, river windings, river terraces, alluvial plains, the general action of water, the torrential track of a river, the action of floods, &c. Geological maps would serve to show the nature of the ground traversed by the river, whilst the varying rate of denudation and mode of weathering could be illustrated by photographs and specimens.

The relation of the surface geology to river action and the occurrence of landslips, the formation of scree, with examples of the various materials, would make a most interesting and valuable study.

The various deposits formed along the track of the river would serve to explain the origin of sedimentary rocks, and the mode of entombment of fossils ; whilst a chart of the river's mouth where it entered the sea, with all the sand-banks coloured, would convey a striking lesson as to the transporting action of rivers generally. Subterranean watercourses could be indicated by diagrams.

Under the head of chemical features could be arranged a series of specimens to show chemical denuding action. The matter held in solution at various points, and the general composition of the river water could be indicated by analytical tables.

This indicates in very brief fashion how one item alone could be developed, and I would leave it to the Geologists now present, to say how valuable the group would be.

Under the head of "*Oceanic Areas and Seas*" much of the work done by the "*Challenger*" can be made use of, and if thought necessary small models of sounding and other apparatus could be made.

A beautiful series of maps which illustrate many of the chief features of oceanic areas will be found in Dr. Mills "*Realm of Nature*" published by John Murray.

Under the third head of "*Relation of Land and Sea*," charts of portions of adjacent coasts most visited by holiday seekers might be used, and attention drawn to the occurrence of sand-banks, beach formations, delta deposits, etc. Coral reefs could be well demonstrated by material, charts, diagrams, and models, illustrating Murray's and Darwin's theories, whilst the remarkable photographs of the Great Barrier Reef of Australia, taken by Saville Kent, and published by Allen and Co., ought not to be omitted.

SECTION III.—PETROGRAPHICAL GEOLOGY.

Section III. deals with the Classification of the Earth's Crust, and is usually represented in Museums. Little need be said in regard to it, although a more generous recognition of rock-forming minerals as such, and of the chemical constitution of rocks, is advisable. A small but representative set of minerals ought to be arranged under this head without prejudice to any other mineral collection the Museum may possess, whilst if no mineralogical collection exists, a fairly satisfactory group could be massed here in its appropriate section.

SECTION IV.—LIFE FEATURES OF THE CRUST.

This division might be developed under Section II. if necessary. It might also be defined as "Present Day Geology."

The Life Features of the Crust would deal with the general facts of distribution of animals and plants.

The conditions necessary for their existence, and the occurrence of well defined regions and realms of life could all be treated of in such a way as to throw some light upon the conditions which must have prevailed in Geological time.

This section would permit of liberal cross-references to the botanical and zoological collections, and could be well illustrated by maps, and diagrams and such illustrations as are furnished by Wallace's "Island Life."

This section would indicate the dependence of animal and vegetable life upon the physical conditions and features of the earth.

One point of considerable value is that it could be made to furnish most positive evidence of older geographical conditions which were very different from those of the

58 THE ARRANGEMENT OF A GEOLOGICAL MUSEUM.

present. For example the elucidation of the fauna of islands and of high mountain slopes would show that land masses now widely separated must have been once continuous.

SECTION V.—STRATIGRAPHICAL GEOLOGY.

This, like Section III., secures some recognition in our present Museum arrangement.

I would, however, advise its extension, and make a liberal use of models of outliers, escarpments, faults, thrust-planes, &c., and make a fuller use of maps, photographs, and diagrams.

The work of the Geological Survey upon the Western Coast of Scotland has, of late years, supplied a great series of sections which could be utilised.

SECTION VI.—PALEONTOLOGICAL GEOLOGY.

This section can be made a means of elucidating the value of fossils in the general study of the Natural Sciences. The manner in which animal and vegetable remains are first entombed in rock matter, needs pointing out, whilst the chemical changes and mineral replacement which have so often taken place in fossils, and which are hardly understood by students, ought to be effectively demonstrated. A continuous series of fossils should be arranged to show the formation of internal and external casts of shells, &c., the replacement by various mineral matters, the retention, or loss of minute structure, and the various degrees of fossilisation of which various animal and vegetable structures are capable.

The student needs to be shown that Calcite shells for instance are more likely to be found fossil than those composed of Aragonite, although their chemical composition is the same, and that the mineral character of

the enclosing rock, its porosity, texture, and other features, all bear a close relationship to the degree of preservation of enclosed remains. How instructive could a series of specimens be made, which included such examples as Solenhofen Slate, with its almost perfect insect remains, a Coal-ball still showing the most minute structure of some Coal Measure plant, a specimen of Greensand with all the contained fossils silicified, and a coarse sandstone with nothing but external and internal casts, and no trace of animal or vegetable matter or structure.

One feature which can also be developed with most excellent results is that of the display of fossils in association. By this I mean the display of massive rock specimens which contain several fossils of different genera and species.

These specimens would show that in times past as to-day, certain animals and plants were fitted to live in a natural association in various areas and under similar conditions.

SECTION VII.—HISTORICAL GEOLOGY.

This, our last, and at present, the main division as it always must be, of our Museums, can hardly be dealt with system by system.

Certain desiderata need to be borne in mind in arranging the materials of all the systems, whilst each has special features it is desirable to bring out.

At present, as we have already said, a System is represented by a collection of its fossils, it is rarely represented by a collection of rock specimens, and there is no attempt to indicate the possible geographical conditions or the sequence of events which ushered it in, dominated it, and closed it for ever.

Too often we find there is an attempt to lead students to believe that certain fossils which we speak of as "characteristic" are all important, and that if he can form a mental picture of them by which they can be recognised at sight, and if he can fit the correct name to each by eye service alone, he has grasped all the salient points of the System and is in a position to say he knows it.

I regard the "characteristic fossil" with some distrust, and think that it blocks the way to a fuller knowledge of the main features of the fauna and flora of a System. In our dealing with Geological Systems we need, it seems to me, to work by a more rigorous method. I would suggest the following :—

First. The display of a map showing the general features of the geography of the period so far as they may be known. As an example of what I mean, I would draw your attention to the maps in Jukes-Brown's "Building of the British Isles."

Secondly. The display of maps showing the present extension of the System geographically, and its local development, if any, in the district served by the Museum.

By such maps the geographical conditions under which the various deposits were formed can be clearly demonstrated, and readily understood, and they will also demonstrate how the orderly succession of deposits of different mineral composition was possible.

This part of our work can only be done in a very generalised fashion, but indications of the great land masses and sea areas would be a great advance upon what we do at present.

Third. The lithology of a system would come next in natural order, and is of the greatest importance, although it is usually omitted altogether.

We are inclined to think it is more truly representative of Geology than a collection of fossils.

A carefully chosen series of rock specimens should be arranged in our cases, and to prevent what is now a fruitful source of error, a series of rock specimens ought to be taken *seriatim* as they occur in nature, to show that whilst a particular name is constantly made use of for a special stratum, yet in that stratum are to be found widely dissimilar rocks.

As an example of what I mean, I may instance our use of such a term as "Forest Marble". The term marble is usually clear and definite enough, but under the head of Forest Marble, as a formation, are included beds of clay, grit, and shelly limestone. The succession of the Forest Marble has been determined by Lonsdale as follows:—

Clay, with occasional laminæ of grit.

Sand and Gritstone.

Clay, with thin slabs of stone, and laminæ of grit.

Shelly limestone, and coarse oolite.

Sand, or sandy clay, and grit.

Bradford Clay.

(H. B. Woodward's Geology of England & Wales,
p. 305.)

Now, it is evident that if we display fossils only, a student could never learn the succession of deposits in which those fossils occurred, while if a few "characteristic" rock specimens were shown and no detailed diagram or complete series, a wrong impression would be given.

The altered lithological characters of a deposit, when it ranges over great distances, ought always to be shown where ever possible, and the evidence furnished by rocks and fossils of the proximity of land.

The student who has worked through the earlier sections will look for indications such as these, in order to

satisfy himself that present day phenomena do really give the clue to past geological history, and if they are not presented to him, he will naturally hesitate to accept the truths upon which Geology is based.

The arrangement of fossils is usually a purely palæontological one within the limits of any System, and upon this it would be difficult to improve.

We might add, however, groups to illustrate the faunas of particular horizons, and also others to show the association of genera and species which possess a similar habitat, if this has not been already attempted.

As far as possible, all fossils which have added considerably to our knowledge of animal and vegetable life ought to be represented by photographs, plaster casts, &c., for example, cast of such fossils as Trilobites showing the appendages, early mammalian jaws, the Elgin reptiles of the Trias, Archæopteryx, and Pterodactylus, of the Oolite, ought to have a place in every geological Museum. Where casts cannot be obtained, small photographs of the best drawings of these remains prove an excellent substitute.

At Manchester, we have found that plates issued with many scientific papers can be utilised, and the series of restorations of monsters by Smit, in Hutchinson's "Extinct Monsters."

Other sources, and other means of illustration will be familiar to you all.

In conclusion, we do not expect that any Museum except a National one could obtain all the material to carry out our plan in its entirety, but a small and even monetarily poor Museum can accomplish great things if search be made for suitable material, and, certainly, the science of Geology will be better understood if all sections of it be represented, rather than one, and that the most difficult to understand.

We ought ever to keep before us the remembrance of what a Geological Museum ought to do and teach. Primarily it ought to teach the science of Geology and demonstrate its essential principles, and do this, as far as possible, by reference to local conditions. In its general features, it ought to embody all the chief characters of a good text book, and, finally and chief of all, it ought to contain so many explanatory general labels, maps, and photographs, as would, if bound together in book form, make a fairly good Geological guide without any material additions or alterations.

*I.—COSMICAL GEOLOGY.

Diagrams to indicate size, weight, and position in space of the earth.

Relation of earth to members of Solar System, illustrated by diagrams or models.

Movements of earth in relation to planetary bodies and upon its own axis. Models and diagrams.

Relation of earth movement and action of planetary bodies to geological phenomena.

Climate, heat zones, tides, the broader features of aerial and oceanic currents.

II.—PHYSIOGRAPHICAL GEOLOGY.

DISTRIBUTION OF LAND AND WATER:—

I. Continental areas.—Contours, surface features, mountain chains, plains, river drainage, lakes.

Evidence of internal heat furnished by land surface, —Geysers, and volcanoes. Geographical distribution of the latter.

Earthquake areas.

II. Oceanic areas and seas.—Distribution of water, contours, currents, depths, character of sea floor, abyssal and transitional areas. Deposits. Ocean temperatures.

III. Relation of Land and Sea.—Climatic conditions—Winds—Continental shelf—Mean sphere level—Discharge of land drainage into sea—Littoral and delta deposits—Beach formation—Marine deposits—Coral islands. Upheaval and depression.

IV. Atmospheric denudation. Marine denudation. Formation of Sedimentary deposits, and inclusion of animal remains.

III.—PETROGRAPHICAL GEOLOGY.

GENERAL CHEMICAL CONSTITUTION OF GLOBE:—

Minerals; Rock forming Minerals; Mode of occurrence of rocks; Stratified, Unstratified; General features; Grouping of rocks according to origin; Igneous; Sedimentary; Metamorphic.

IV.—LIFE FEATURES OF CRUST.

Distribution of Animal and Vegetable Life; Faunal and Floral Regions; Ditto of Sea; Vertical and horizontal distribution of animal and plants; Dependence of certain faunas and floras upon environment; Evidence of older and different geographical conditions, instanced by island faunas and mountain plants, &c. Anthropology; Man, Races, Geography, Civilisation and Environment.

V.—STRATIGRAPHY.

Stratification of rocks; Succession of strata and order of super-position; Evidence of deposition—ripple-marks—rain-pittings—sun-cracks—current-bedding—drifted

material—thinning and swelling out of beds; Conformability and unconformability; Groups of strata; Evidence of former extensions—outliers, escarpments, &c.; Jointing of rocks; Folding and Inclination, cleavage, &c.; Faulting—various kinds—Thrust planes. Inversion. Effect of faults upon strata.

VI.—PALÆONTOLOGICAL GEOLOGY.

Fossils—entombment—mode of preservation; Fossilisation; Value of fossils in Geology—in Chronology—in Zoology; Association of fossils.

VII.—HISTORICAL GEOLOGY.

Division into Systems; Geographical and local development; Lithological succession; Fauna, &c.

THE PRESIDENT said: The photographs exhibited are extremely suggestive to all of us. If you look at them you will see how very much teaching they afford. For my own part, I feel indebted greatly to an Irish geologist with regard to the illustration of rock structure. I refer to Juke's "Popular Physical Geography." This little book, published in 1853, had a great charm when it first came out on account of the illustrations, which were lithographic instead of photographic. I need not mention the superiority of photographs in our own day and their usefulness in reproducing geological features. May I call attention to another point in connection with strata. In our geological Museums, as a rule, rock specimens are separated from the fossil collections and commonly take their place among the minerals. In such a position much of their usefulness is often lost. It would be well that the geological portion of a Museum should teach the visitor, as he walks about that particular neighbourhood, to what formation a rock section belongs, and, in order to do this, specimens of small size should represent the different aspects of the particular strata in connection with which the fossils of the neighbourhood are found, and be placed in proximity to such fossils.

MR. WHITE said: Mr. Bolton's paper is so admirable that if the scheme he has set forth were adopted, it would, I think, produce a complete revolution in our Museum illustration of geology. The difficulty, of course, in practically carrying out such a scheme is that the existing

66 THE ARRANGEMENT OF A GEOLOGICAL MUSEUM.

conditions in our Museums rarely, unfortunately, admit of such a change. But from time to time as the galleries of the Museums are extended, the opportunity is then afforded to develop the arrangement and illustration of the various groups of rocks, and nothing could be better than what Mr. Bolton has so carefully thought over in his proposed arrangement. I would even suggest that it might be carried much further still. At present, geological collections are generally represented by fossils contained in table cases and drawers. Would it not be far better for a geological department to be arranged around the walls of the room in large, upright wall cases? It would then be possible to exhibit, not merely small earthy fragments—which is something as a beginning—but entire rock masses, complete sections of the various sedimentary and other rocks, instead of merely showing the paper or paint on the walls or backs of the cases. By such means an excellent background is formed for exhibiting the typical fossils, and other characteristics, on the connected shelves. If any examples could be shown illustrating the junction, the crumpling, the false bedding, &c., of the rocks, it would be an additional advantage. I am sure such a method would at once strike the visitor, whether he had any previous knowledge of geology or not; and would afford a ready means of the identification of rocks as seen by him in his various journeys through the country. The addition of such admirable photographs, as Mr. Bolton has brought for exhibition in this connection, would form another attractive picture. By means of such pictures alone people would begin to take an interest in what is, at the present time a very dry study; and they would soon be fascinated by this ready method of connecting fossils with the rocks from which they are derived. At the present time they take no interest whatever in mere fossils, and consider those who do as mere fossils themselves; but if they became acquainted with the stratification of rocks, and the causes which brought about the conditions which are so surprising, they would immediately take an intelligent interest in the geological department of our Museums.

Mr. HOWARTH said, in connection with the illustration of the cases, it was not every one who was fortunate enough to get copies sent to them from the authors, and they could not always cut up books. In Sheffield he had had copies made, and it might be interesting for them to know that he engaged students from the Art School. It was good practice for them and it did not cost the Museum much. They paid a fair price for them, however. They produced more effective pictures than the small illustrations from books. He found these things very attractive indeed in the case of extinct animals.

Mr. HOYLE asked how Mr. Howarth paid those unfortunate students. Hutchinson's book cost ten shillings, and upon that they got a discount.

The book contained about 15 or 20 plates, so that the cost of each was very small. If the copying was done cheaper he would like to hear how it was done.

Mr. HOWARTH said they could not get everything from Hutchinson's books; nor could such small illustrations be found suitable in all Museums, the larger drawings being much more useful and effective. The prices paid ranged from half-a-crown to about two pounds, according to the size and details of the work.

Mr. CAMERON, M.P. (Sunderland), said :—"I do not consider that fossils are necessarily the most uninteresting feature of a Museum, but if their value is made known by Museum lectures, and if the teachers of secondary and elementary schools took real interest in Geological studies, and induced pupils to make private collections, if the miners of our collieries and in all mining districts were urged to observe and collect specimens and bring them to our Museums to be named, you might find that the fossil collections of a Museum will become more and more interesting just in proportion as you popularise knowledge respecting their scientific value. At present they are only mystic symbols to a few specialists who sometimes seem to me jealous of the intrusion of the uninitiate. There is only one other remark I wish to make—it is this:—It is true we may foolishly multiply specimens and even duplicates in representing the general sequence of life on the earth, but local Museums should, I think, as their first duty, strive to fully represent the fossils of their own districts: even naming the particular spots and quarries where they are found. In my own locality (Sunderland) I felt it my first duty to make an almost complete collection of the Permian fossils of our district. All Geologists know that they are rare and of special interest as they represent the close of the Palaeozoic Period. I consider Mr. Bolton's paper of great value. It sketches a system that is both natural and logical, perhaps for logical purposes it may be somewhat too comprehensive, yet in the eyes of students this may be its great merit. We learn from it what is needed and how it should be realised. I have not listened to a more genuinely interesting paper since this Association began. My conclusion after hearing it is that more accommodation is the great need of the future. The public, all corporate bodies, and even the Government, must be appealed to so that our Museums may be enabled to do more effectually the educational work for which they are specially adapted."

Mr. F. W. RUDLER (London), said :—No one interested in the development of a Geological Museum can fail to appreciate this paper very highly, and many of us who are responsible for the arrangement of geological collections must admit the justice of much that Mr. Bolton has

68 THE ARRANGEMENT OF A GEOLOGICAL MUSEUM.

said with regard to the general neglect of physical geology. At the Museum of Practical Geology, however, we have for many years attempted to illustrate this department of science by exhibiting specimens of rocks shewing the action of wind, rain, rivers, ice, &c., but it is by no means easy to procure suitable examples for a Museum. Volcanic phenomena, on the other hand, lend themselves more readily to such illustrations. In many cases, however, it is necessary to be content with diagrams, photographs, and other pictorial illustrations. A thoughtful Curator will utilize every square foot of available wall-space, and the illustrations exhibited by Mr. Bolton are excellent examples of suitable subjects. Some of Mr. Welch's beautiful photographs of basaltic scenery in Ireland were enlarged for the Chicago Exhibition, and copies may be seen in Jermyn Street. The Committee of the British Association for collecting geological photographs obtained a very valuable series of illustrations ; nor should the Curator, in quest of material, overlook the large chromolithographs issued by Hölzel, of Vienna, on the small wood-cuts forming the *Bildertafeln* of Hirt of Breslau ; the former suitable for suspension on the wall, the latter for placing in the interior of cases.

Mr. BOLTON spoke of the purchase of photographs, referring to various Art Portfolios recently published at sixpence, and which, he said, contained half-a-dozen plates useful and sufficiently good to go into a Museum to illustrate very important facts. One to which he particularly referred showed the coast of Cromer being cut away by the sea. There was another of Shanklin, showing the "Under Cliff," and illustrating the fact that the sea-coast had been rising. They had further several magnificent samples of *Stacks* and marine denudation. The photographs, he added, which had been collected by the British Association, were also valuable. They were not made use of to any considerable extent at present, but there was no reason why they should not be. The negatives are kept in order that the productions might be used to illustrate geological teaching.

THE PRINCIPLES OF MUSEUM ADMINISTRATION.

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ANALYSIS.

- I. INTRODUCTION.
 - II. THE MUSEUM AND ITS RELATIONSHIPS.
 - III. THE RESPONSIBILITIES AND REQUIREMENTS OF MUSEUMS.
 - IV. THE FIVE CARDINAL NECESSITIES IN MUSEUM ADMINISTRATION.
 - V. THE CLASSIFICATION OF MUSEUMS.
 - VI. THE USES OF SPECIMENS AND COLLECTIONS.
 - VII. THE PRESERVATION AND PREPARATION OF MUSEUM MATERIALS.
 - VIII. THE ART OF INSTALLATION.
 - IX. RECORDS, CATALOGUES, AND SPECIMEN LABELS.
 - X. EXHIBITION LABELS AND THEIR FUNCTION.
 - XI. THE FUTURE OF MUSEUM WORK.
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INTRODUCTION.

In an article on "The use and abuse of Museums" written nearly fifteen years ago by Professor William Stanley Jevons, it was stated that there was not at that time in the English language a treatise

analysing the purposes and kinds of Museums, and discussing the general principles of their management and economy. It is somewhat surprising that the lack then made so evident has not since been supplied and that there is not at the present day such a treatise in the English or any other language. Many important papers have in the interval been printed in regard to particular classes of Museums and special branches of Museum work. Notable among these have been the addresses by Sir William H. Flower on the uses and conduct of Natural History Museums. Among the especially significant general papers which had previously been printed, were Edward Forbes's suggestive essay on "The Educational Uses of Museums," dated 1853, and the still earlier one by Edward Edwards on "The Maintenance and Management of Public Galleries and Museums," printed in 1840.

No one, however, has as yet attempted, even in a preliminary way, to formulate a general theory of administration applicable to Museum work in all its branches, except Professor Jevons, who in the paper already referred to presented in an exceedingly suggestive manner the ideas which should underlie such a theory.

It is still true, however, as it was when Professor Jevons wrote in 1881, that there is not in existence "a treatise analysing the purposes and kinds of Museums and discussing the general principles of their management and economy." With this fact in mind, I have ventured to attempt the preparation of such a treatise, and to bring together in one systematic sequence the principles which I believe to underlie the policy of the wisest and most experienced of modern Museum administrators.

My ideas are presented in a somewhat dogmatic manner, often in the form of aphorisms, and possibly many of

them may sound like truisms to the experienced Museum administrator.

I have no doubt that my purpose in preparing this paper will be at once understood by the members of the Museums Association.

I have had two objects in view:

It has been my desire, in the first place, to begin the codification of the accepted principles of Museum administration, hoping that the outline which is here presented may serve as the foundation for a complete statement of those principles, such as can only be prepared by the co-operation of many minds. With this in view, it is hoped that the paper may be the cause of much critical discussion.

My other purpose has been to set forth the aims and ambitions of modern Museum practice, in such a manner that they shall be intelligible to the persons who are responsible for the establishment of Museums, and the conduct of other public institutions founded for similar purposes, in order to evoke more fully their sympathy and co-operation.

Museums of art and history, as well as those of science, are discussed in this paper, since the same general principles appear to be applicable to all.

The theses proposed are as follows:

I.—THE MUSEUM AND ITS RELATIONSHIPS.

A.—THE MUSEUM DEFINED.

1. A Museum is an institution for the preservation of those objects which best illustrate the phenomena of nature and the works of man, and the utilization of these for the increase of knowledge and for the culture and enlightenment of the people.

B.—THE RELATION OF THE MUSEUM TO OTHER INSTITUTIONS OF LEARNING.

1. The Museum in its effort for the increase and diffusion of knowledge aids, and is aided by the university and college, the learned society and the public library.

2. The special function of the Museum is to preserve and utilize objects of nature and works of art and industry: that of the library to guard the records of human thought and activity: that of the learned society to discuss facts and theories: that of the school to educate the individual:—while all meet together on common ground in the custodianship of learning, and in extending the boundaries of knowledge.

3. The care and utilization of material objects being the peculiar duty of the Museum, it should not enter the field of other institutions of learning, except to such a degree as may be found absolutely necessary in connection with its own work.

For example, its library should contain only such books as are necessary for use within its own walls. Its publications should be solely those which are (directly or indirectly) the outgrowth of its own activities. Its teaching work should be such as cannot be performed by other institutions.

On the other hand, schools may advantageously limit their cabinets in accordance with the needs of their lecture-rooms and laboratories, and the library and the learned society should not enter the field of the museum, except in localities where Museum agencies are not provided.

C.—THE RELATION OF THE MUSEUM TO THE EXPOSITION.

1. The Museum differs from the Exposition or Fair both in aims and in method.

2. The Exposition or Exhibition and Fair are primarily for the promotion of industry and commerce; the Museum for the advancement of learning.

3. Of the former, the principal object is to make known the names of the exhibitors for their own professional or financial advantage; in the latter the name of the exhibitor is incidental, the thing chiefly in mind being the lesson taught by the exhibit.

4. Into the work of the former enters the element of competition coupled with a system of awards by diplomas or medals; in the latter, the element of competition does not appear.

5. The educational results of Expositions, though undeniably important, are chiefly incidental, and not at all proportionate to the prodigal expenditure of energy and money which are inseparable from every great Exposition.

D.—MUSEUM FEATURES ADOPTED IN EXPOSITIONS.

1. Museum methods have been in part adopted by many Expositions, in some instances to attract visitors, in others because it has been desired to utilize the occasion to give Museum lessons to multitudes to whom Museums are not accessible.

2. Those Expositions which have been most successful from an educational standpoint have been the ones which have most fully availed themselves of Museum methods,—notably the London Exhibition of 1851 and the Paris Exposition of 1889.

3. Special or limited Exhibitions have a relatively greater educational value, owing to the fact that it is possible in these to apply more fully the methods of the Museum. The four Expositions held in London in the last decade—Fisheries, Health, Inventions, and Colonial—are good illustrations.

4. The annual exhibitions of the academies of art are allied to the Exposition rather than to the Museum.

5. Many so-called "Museums" are really "permanent exhibitions," and many a great collection of pictures can only be suitably designated by the name "picture-gallery."

E.—TEMPORARY MUSEUMS.

1. There are many exhibitions which are administered in accordance with Museum principles, and which are really temporary Museums. To this class belong the best of the loan exhibitions, and also special exhibits made by public institutions, like the Luther "Memorial Exhibition" of 1894, the material for which was derived chiefly from the Library of the British Museum, and similar exhibitions subsequently held under the same auspices.

F.—MUSEUM METHODS IN OTHER INSTITUTIONS.— "MUSEUM EXTENSION."

1. The Zoological Park, the Botanical garden and the Aquarium, are essentially Museums, and the principles of Museum administration are entirely applicable to them.

2. An Herbarium in its usual form corresponds to the study-series in a Museum, and is capable of expansion to the full scope of the general Museum.

3. Certain churches and ecclesiastical edifices as well as antiquities in place, when they have been pronounced "public monuments," are subject to the principles of Museum administration.

4. Many cities, like Rome, Naples, Milan and Florence, by reason of the number of buildings, architectural features, sculpture and other objects in the streets and squares, together with the historical houses duly labelled by tablets, have become practically great Museums and these various objects are administered much in the manner of Museums. Indeed the number of "public monuments" in Italy is so great that the whole country might properly be described as a Museum of art and history. A

government commission for the preservation of the monuments of history and art regulates the contents of every church, monastery, and public edifice, the architectural features of private buildings, and even private collections, to the extent of requiring that nothing shall be removed from the country without governmental sanction. Each Italian town is thus made a Museum, and in Rome, the site of the Forum and the adjacent structures has been set aside as an outdoor Museum under the name of the *Passeggiata Archeologica*. Similar government control of public monuments and works of art exists in Greece, and Egypt, and in a lesser degree in the Ottoman Empire; and for more than half a century there has been a Commission of Historic Monuments in France, which has not only efficiently protected the national antiquities, but has published an exceedingly important series of descriptive monographs concerning them.

II.—THE RESPONSIBILITIES AND REQUIREMENTS OF MUSEUMS.

A.—THE RELATION OF THE MUSEUM TO THE COMMUNITY.

1. The Museum supplies a need which is felt by every intelligent community and which cannot be supplied by any other agency. The Museum does not exist except among highly enlightened peoples, and attains its highest development only in great centres of civilization.

2. The Museum is more closely in touch with the masses than the university and learned society, and quite as much so as the public library, while even more than the last, it is a recent outgrowth of modern tendencies of thought. Therefore—

3. THE PUBLIC MUSEUM IS A NECESSITY IN EVERY HIGHLY CIVILIZED COMMUNITY.

B.—THE MUTUAL RESPONSIBILITIES OF THE COMMUNITY AND THE MUSEUM.

1. The Museums in the midst of a community perform certain functions which are essential to its welfare, and hence arise mutual responsibilities between the community and the Museum administrator.
2. The Museum administrator must maintain his work with the highest possible degree of efficiency in order to retain the confidence of the community.
3. The community should provide adequate means for the support of the Museum. (See Chapter III.)
4. A failure on the part of one leads inevitably to a failure on the part of the other.

C.—THE SPECIFIC RESPONSIBILITIES OF THE MUSEUM.

1. The Museum should be held responsible for special services, chiefly as follows :

a. For the advancement of learning.

To aid learned men in the work of extending the boundaries of knowledge, by affording them the use of material for investigation, laboratories and appliances.

To stimulate original research in connection with its own collections, and to promote the publications of the results.

b. For record.

To preserve for future comparative and critical study the material upon which studies have been made in the past, or which may confirm, correct, or modify the results of such studies. Such materials serve to perpetuate the names and identifications used by investigators in their publications, and thus

authenticated, are useful as a basis for future investigation in connection with new material. Specimens which thus vouch for the work of investigators are called *Types*. Besides Types, Museums retain for purposes of record many specimens which, though not having been used in investigation, are landmarks for past stages in the history of man and nature.

c. As an adjunct to the class-room and the lecture-room.

To aid the teacher either of elementary, secondary, technological, or higher knowledge in expounding to his pupils the principles of Art, Nature, and History, and to be used by advanced or professional students in practical laboratory or studio work.

To furnish to the advanced or professional student, materials and opportunity for laboratory training.

d. To impart special information.

To aid the occasional enquirer, be he a laboring-man, schoolboy, journalist, public speaker, or savant, to obtain, without cost, exact information upon any subject related to the specialties of the institution ; serving thus as a "Bureau of Information."

e. For the culture of the public.

To serve the needs of the general public, through the display of attractive exhibition series, well-planned, complete and thoroughly labelled ; and thus to stimulate and broaden the mind of those who are not engaged in scholarly research, and to draw them to the public library and the lecture room. In this respect the effect of the Museum is somewhat analogous to that of travel in distant regions.

2. A Museum to be useful and reputable, must be constantly engaged in aggressive work, either in education or investigation, or in both.

3. A Museum which is not aggressive in policy and constantly improving, cannot retain in its service a competent staff, and will surely fall into decay.

4. A FINISHED MUSEUM IS A DEAD MUSEUM, AND A DEAD MUSEUM IS A USELESS MUSEUM.

5. Many so-called "Museums" are little more than storehouses filled with the materials of which Museums are made.

D.—THE RESPONSIBILITY OF MUSEUMS TO EACH OTHER.

1. There can be no occasion for envious rivalry between Museums even when they are in the same city. Every good Museum strengthens its neighbours, and the success of the one tends to the popularity and public support of the others.

2. A system of co-operation between Museums is seemingly possible by means of which much duplication of work and much expenditure of money may be avoided.

3. The first and most important field for mutual understanding is in regard to specialization of plan. If Museums in the same town, province, or nation, would divide the field of work so that each should be recognized as having the first rights in one or more specialties, rivalry would be converted into friendly association, and the interests of science and education better served.

4. An important outcome of such a system of co-operation might be the transfer of entire groups of specimens from one Museum to another. This would greatly facilitate the work of specialization referred to, and at the same time relieve each Museum of the responsibility of maintaining collections which are not germane to its real purpose. Such transfers have occasionally been made in the past and there are few Museums which might not benefit individually, in a large degree, by a sweeping

application of this principle. If its effect on the attractiveness and interest of any local or national group of Museums be taken into account, as no one can doubt that the result would be exceedingly beneficial.

5. Another field for co-operation is in joint expenditure of effort and money upon labels and catalogues, and in the economical purchase of supplies and material.

In the United States, for instance, the iron moulds for specimen jars used for terra cotta mounting tablets, and the dies used in rolling the metal guiding strips for supporting the drawers in specimen cabinets, which have been made at considerable expense for the National Museum, are placed without cost at the disposition of other Museums; drawings and specifications for the construction of cases, and many other results of experiment in this Museum, are placed at the service of all others.

6. Still another would lie in the co-operative employment of expert curators and preparators, it being thus practicable to pay larger salaries and secure better men.

The curator of Graphic Arts in the United States National Museum is the custodian of the collection of engravings in the Boston Museum of Fine Arts, giving part of his time to each institution—an arrangement advantageous to both.

III.—THE FIVE CARDINAL NECESSITIES IN MUSEUM ADMINISTRATION.

A Museum cannot be established and creditably maintained without adequate provision in five directions:

A. A stable organization and adequate means of support.

B. A definite plan, wisely framed in accordance with the opportunities of the institution and the needs of the community for whose benefit it is to be maintained.

C. Material to work upon—good collections or facilities for creating them.

D. Men to do the work—a staff of competent curators.

E. A place to work in—a suitable building.

F. Appliances to work with—proper accessories, installation materials, tools, and mechanical assistance.

A.—STABILITY OF ORGANIZATION.

1. The only absolute assurance of permanence for a Museum lies either in governmental protection, or in a connection with some endowed institution of learning, or in special organization with ample endowments.

2. The cabinets of unendowed societies, or those gathered and supported by the efforts of individuals, must inevitably in time be dispersed or destroyed.

B.—DEFINITENESS OF PLAN.

1. No two Museums can be or ought to be exactly alike. Each should be devoted to one or more special subjects, and should select those subjects not only with reference to opportunity and the needs of the community, but also with regard to the specialties of other Museums in the same region with a view to co-operation.

2. It is the duty of every Museum to be pre-eminent in at least one specialty, be this specialty never so limited.

3. The specialties or departments of any Museum may be few or many, but it is important that its plan should be positively defined and limited, since lack of purpose in Museum work, leads in a most conspicuous way to a waste of effort, and to partial or complete failure.

4. It will undoubtedly be found desirable for certain Museums, founded for local uses, to specialize mainly in the direction of popular education. If they cannot also provide for a certain amount of scholarly endeavour in connection with the other advantages, it would be of the utmost importance that they should be associated (by a system of co-operation) with some institution which is in the position of being a centre of original work.

5. The general character of a Museum should be clearly determined at its very inception. Specialization and division of labor are essential for institutions as well as

for individuals. It is only a great national Museum which can hope to include all departments, and which can with safety encourage growth in every direction.

6. Small Museums, it is needless to say, cannot attempt specialization in the same degree as large ones, but the principles just enunciated should be constantly kept in view even by the least of them.

C.—COLLECTIONS.

1. The sources of collections are the following : (a) by gift ; (b) by purchase ; (c) by exchange ; (d) by collecting and exploration ; (e) by construction ; (f) through deposit or temporary loan.

a. *By gift.*

Acquisition by gift is a most important source, but very uncertain. If a Museum has a plan to which it intends to adhere, a large proportion of the gifts offered to it will be unavailable ; while on the other hand only a small proportion of the desiderata will ever be thus obtained. A Museum may properly, by the offer of a large and complete collection illustrating a subject outside of its plan, be induced to expand its scope. In the case of a large benefaction of this kind, necessitating extensive changes in installation, there will always be careful consideration of the result. It should be borne in mind, however, that the random, thoughtless acceptance of proffered gifts which insignificant in itself but in the course of a few years by no means insignificant in the consumption of space and money for their care, may modify the plan of a Museum in a most radical manner. It requires quite as much judgment and mental effort on the part of a Museum officer to keep out unsuitable objects as to bring in those which are desirable.

b. By purchase.

Acquisition by purchase is often the only means of obtaining desirable objects, particularly so in the case of Art Museums, least so in Natural History Museums. Money is especially necessary for the filling of gaps in series obtained by gift or otherwise.

c. By exchange.

Acquisition by exchange is especially advantageous, since it enables a Museum to dispose of unavailable duplicate material. When exchanges are made with well conducted Museums, there is the additional advantage that the materials thus obtained have been studied and identified by expert authorities. Little is gained by conducting exchanges in a commercial spirit and in insisting on too exact valuations and balancing of equivalents, especially when the parties to the exchange are public institutions. Large Museums in dealing with small ones may often advantageously give largely and receive comparatively little in return, since they not only become disengaged of useless duplicates not desired by institutions of equal rank, but they are also building up sister institutions which may in time afford them much more substantial aid. Exchanges with private collectors may well be carried on in the same spirit, since the collector is thus encouraged to gather more material, in the midst of which unexpected treasures may come to light, and is also aided to build up a private collection which in time will probably fall into the hands of some public Museum.

d. By collecting and exploration.

For all Museums save those of art this is usually the most profitable and satisfactory, since by gathering fresh material in unexplored fields, new facts are

discovered, science is enriched, and the reputation of the institution improved. Furthermore, material is obtained in such large quantities that there always remains much in the way of duplicate specimens valuable for exchange. A Museum which carries its activities into unexplored fields, secures for itself material which will always be unique and unobtainable by others, and thus makes itself a centre of interest for the entire world.

The smallest Museum can enrich its collections and make contributions to enlarge others by modest explorations under its own walls ; it can do much by simply encouraging the people in the adjacent region to save what they accidentally encounter in the course of their daily pursuits. Explorations of this kind are pre-eminently the function of the local and provincial Museum.

e. By construction.

Any Museum may do much to enrich its exhibition series by the construction of models and the making of drawings and maps and by making copies of important objects in its own collections to secure material to be used in exchange. Even small Museums may do this, for extensive workshops are not necessary. A specialist himself devoid of mechanical skill may accomplish marvellous things with the aid of a patient mechanic.

f. Through deposit and temporary loan.

Possessors of private collections will often lend them for purposes of exhibition or study, if assured that they will be properly cared for. Such loan collections often become permanent gifts. Single specimens, or small groups of objects, still more frequently

are offered on deposit, and such deposits when within the province of the Museum should be encouraged.

COMMENT.—In the United States National Museum small deposits are received for short periods, but large collections involving trouble and expense in installation, only with the understanding that they shall not be removed within a certain period—never less than two years.

2. Collections which are encumbered by conditions as to manner of disposition and installation are usually sources of serious embarrassment. It is especially undesirable to accept either as a gift or as a loan any unimportant collection with the pledge that it shall be kept intact and installed as a unit. The acceptance of any collection, no matter how important, encumbered by conditions, is a serious matter, since no one can foresee how much these conditions may interfere with the future development of the Museum.

3. Gifts, deposits, and co-operation of all kinds may be greatly encouraged by liberal acknowledgment upon labels and in public reports. This is but simple justice to the generosity of the benefactor. It is also a legitimate way to gratify a natural and praiseworthy sentiment; for a collection to the accumulation of which a man has devoted a lifetime becomes so connected with his personality, that it is but natural that he should wish his name to be permanently associated with it. If acknowledgment of this kind is made upon the individual label of each specimen, this will usually fully satisfy the desire of the donor that the individuality of his gift should be preserved, an arrangement much more satisfactory than one requiring that the objects shall be kept together and treated as a unit for installation.

Gifts and deposits may also be encouraged by the fact that the buildings are fire-proof, the cases so built as to afford perfect protection, and the scheme of installation

dignified and attractive. Collections of great value may to advantage be afforded accommodations of a specially sumptuous character, and such protection, in case of priceless objects, as is afforded by special electric attachments.

4. Notwithstanding what has been said about the importance of specialization, it is often necessary for a Museum to accept collections of objects not at all germane to its plan. This is particularly so in Provincial Museums, when valuable private cabinets are offered as gifts. It may be impolitic for an institution to refuse such an offer, and it is much less disastrous to receive a special collection to be installed as a unit, than to accept numerous promiscuous gifts. In time, in all probability, a collection of this kind can be transferred to the custody of some other institution in the same town, and the Museum which has housed it in the meantime has deserved well of the community by preserving for it a valuable possession.

5. Since the plan and character of a Museum is largely determined for all time by the nature of the collections which fall first into its possession, at the time of its organization, the authorities temporarily in charge of such an institution at the time of organization should be exceedingly careful in accepting materials which are to serve as a nucleus for its future growth.

COMMENT.—It is not unusual for boards of trustees, having erected a building, to proceed at once to partially fill it with showy material before the staff has been appointed or a plan considered. This can only be characterized as "pernicious activity," which is certain to result in more harm than good. A plan having been determined upon and a director selected, the collections may be developed at much less expenditure and with any degree of rapidity which may be desired.

D.—MUSEUM OFFICERS.

1. A Museum without intelligent, progressive, and well-trained Curators is as ineffective as a school without teachers, a library without librarians, or a learned society without a working membership of learned men.

2. Museum administration has become one of the learned professions, and success in this field can only be attained as the result of years of study and of experience in a well-organized Museum. Intelligence, a liberal education, administrative ability, enthusiasm, and that special endowment which may be called "the Museum sense," are pre-requisite qualifications.

Each member of a Museum staff should become an authority in some special field of research, and should have time for investigation and opportunity to publish its results.

3. A Museum which employs untrained Curators, must expect to pay the cost of their education in delays, experimental failures, and waste of materials.

4. No investment is more profitable to a Museum than that in its salary fund, for only when this is liberal may the services of a permanent staff of men of established reputation be secured.

Around the nucleus of such a staff will naturally grow up a corps of volunteer assistants, whose work properly assisted and directed will be of infinite value.

5. "Collaborators" or "Associates," as well as Curators, may be placed upon the staff of a large Museum, the sole duty of the former being to carry on investigations, to publish, and, if need be, to lecture.

6. Volunteers may be advantageously employed either as Curators and custodians, or Collaborators. Such co-operation is especially desirable and practicable when a Museum is situated in the same town with a college, or

university, or in a national capital where there are scientific bureaus connected with the Government. Professors in a university or scientific experts in the Government service, often find it of great advantage to have free access to the facilities afforded by a Museum, and are usually able to render useful service in return. Younger men in the same establishments may be employed as volunteer-aids, either in the Museum or in the field.

7. No man is fitted to be a Museum officer who is disposed to repel students or inquirers, or to place obstacles in the way of access to the material under his charge.

8. A Museum officer or employé should, for obvious reasons, never be the possessor of a private collection.

9. The Museum which carries on explorations in the field as a part of its regular work has great advantages over other institutions in holding men of ability upon its staff and in securing the most satisfactory results from their activities. No work is more exhausting to body and mind than the care of collections, and nowhere are enthusiasm and abundant vitality more essential. Every Museum must constantly obtain new material through exploration, and it is better that this exploration should be done by the men who are to study the collections and arrange them, than that this should be placed in the hands of others. The necessity of exploration, from another point of view, has already been spoken of.*

10. In a large Museum staff it is almost essential that certain persons should give their attention chiefly to administrative and financial matters, thus leaving their associates free from occupation of this description. The business affairs of a Museum cannot be conducted with too great promptness and precision. It is desirable, how-

* III. C., 1, d.

ever, that the administrative officers of a Museum should be men who comprehend the meaning of Museum work and are in sympathy with its highest aims, and that its business affairs and scientific work should be controlled by the same executive head.

E.—MUSEUM BUILDINGS.

1. The Museum building should be absolutely fire-proof and substantially constructed ; the architecture simple, dignified and appropriate—a structure worthy of the treasures to be placed within.
2. Above all things the interior should be well lighted and ventilated, dry and protected from dust. The halls should be well-proportioned, the decoration simple and restful to the eye. No decorative features should be permitted which tend to draw attention from the collections or reduce the floor or wall spaces.
3. While the Museum building should be planned with reference to the character of the collections it is to contain, the fact that unexpected development or rapid growth in some one direction may necessitate the rearrangement and reassignment of halls to different departments should always be borne in mind.
4. Since no two Museums can be alike, there can be no general uniformity in their buildings. It is manifestly undesirable then that a board of trustees should erect a building for a Museum before its character is decided upon or its staff appointed ; or that the opinion of the architect of a Museum building should be allowed to overweigh the judgment of the experts who are responsible for its utilization after completion. Museum architecture affords no exception to the principle that an edifice should be perfectly adapted to the purpose for which it is

designed. No architectural effect which lessens the usefulness of the building can be pleasing to an intelligent public.

F.—ACCESSORIES TO MUSEUM WORK.

1. A well-equipped Museum requires as accessories to its work—

A. A reference library, for the use of staff, students and visitors.

B. Laboratories for the classification of material; for the storage of the study-series, and for the use of students and investigators.

C. Workshops for preparation, mounting and repair of specimens, and for the making and adjustment of mounts and cases, and storage rooms for material not yet available. (A printing press is an essential feature.)

D. An assembly hall for public lectures, society meetings, and special exhibitions.

E. A bulletin, or other official publication, to preserve the history of its activities, to maintain its standing among similar institutions, to serve as a means of communication with correspondents, and to exchange for specimens and books for the library.

2. In addition to local accessories, the opportunity for exploration and field work are equally essential, not only because of considerations connected with the efficiency of the staff already referred to (see III. D., 1), but in behalf of the general welfare of the institution. Other things being equal, exploration can be carried on more advantageously by the Museum than by any other institution of learning, and there is no other field of research which it can pursue to better advantage.

IV.—CLASSIFICATION OF MUSEUMS.

Museums may best be classified in two ways ; by the character of their contents, and by the purposes for which they are founded.

Under the first category they may be grouped as follows :

- A. Museums of Art ; b. Historical Museums ; c. Anthropological Museums ; d. Natural History Museums ; e. Technological Museums ; f. Commercial Museums.

Under the second category they may be classed as :

- g. National Museums ; h. Local, Provincial, or City Museums ; i. College and School Museums ; j. Professional or Class Museums ; k. Museums or Cabinets for special research owned by societies or individuals.

COMMENT.—In the reference to special Museums in this chapter, nothing has been further from my idea than to catalogue existing Museums. Many of the most important are not even referred to by name. I have spoken only of those which are especially familiar to myself, and which seem to be the best illustration of the idea in connection with which they are named.

A.—ART MUSEUMS.

1. The Museum of Art is a Depository for the æsthetic products of man's creative genius, such as paintings, sculptures, architecture (so far as it can be shown by models, drawings and structural fragments), and specimens of the illustrative arts, (such as engravings) and illustrations of the application of art to decorative uses.

2. The greater art collections illustrate, in a manner peculiarly their own, not only the successive phases in the intellectual progress of the civilized races of man, their sentiments, passions, and morals, but also their habits and customs, their dress, implements, and the minor accessories of their culture often not otherwise recorded.

3. Museums of Art, wherever they may be situated, have a certain general similarity to each other in purpose, contents and method of management. Those which most fully represent the art of the communities to which they belong, other things being equal, are the most useful and famous.

COMMENT.—Since Cosmo de' Medici founded in Florence at the beginning of the sixteenth century, the Museum of the Uffizi—perhaps the oldest Museum of Art now in existence,—every great city in the civilized world has become the seat of a Museum or gallery of art. Besides the great general collections of art, there are special Museums devoted to the work of single masters, such as the Thorwaldsen Museum in Copenhagen, and the one at Brussels containing only the works of the eccentric painter, Wiertz; the Donatello Museum in the Bargello at Florence, and the Michel Angelo Collections in its Academy of Fine Arts and in the Casa Buonarrotti.

4. The distinction between an Art Museum and a Gallery of Art is a valid one. It depends upon the system of Administration, and the character of the officers who control it.

COMMENT.—The scientific tendencies of modern thought have permeated every department of human activity, even influencing the artist. Many art galleries are now called Museums, and the assumption of the name usually tends toward the adoption in some degree of a scientific method of installation. The Cluny Museum in Paris is, notwithstanding its name, simply a gallery of curious objects. Its contents are arranged primarily with reference to their effect. The old monastery in which they are placed, affords a magnificent example of the interior decorative art of the Middle Ages.

The Cluny Museum is a most fascinating and instructive place. I would not have it otherwise than it is, but it will always be unique, the sole representative of its kind. The features which render it attractive would be ruinous to any Museum. It is, more than any other that I know, a collection from the standpoint of the artist. The same material, in the hands of a Klemm or Pitt Rivers, arranged to show the history of human thought, would, however, be much more interesting, and, if the work were judiciously done, would lose none of its æsthetic allurements.

Another collection of the same general character as the one just described is the Soane Museum in London. Another, the famous collection

of crown jewels and metal work in the Green Vaults at Dresden, a counterpart of which may be cited in the collection in the Tower of London. The Museum of the Hohenzollerns in Berlin and the Museum of the City of Paris are of necessity unique. Such collections can not be created. They grow in obedience to the action of natural law, just as a tree or a sponge may grow.

The city which is in the possession of such an heirloom is blessed just as is the possessor of an historic surname, or he who inherits the cumulative genius of generations of gifted forefathers. The possession of one or a score of such shrines does not however, free any community from the obligation to form a Museum for purposes of education and scientific research.

B.—HISTORICAL MUSEUMS.

1. The Museum of History preserves those material objects which are associated with events in the history of individuals, nations, or races, or which illustrate their condition at different periods in their national life.

2. Every Museum of Art and every Archæological Museum is also a Museum of History since it contains portraits of historical personages, pictures of historical events, and delineations of customs, costumes, architecture and race characteristics.

COMMENT.—Historical Museums are manifold in character, and usually of local interest. Some relate to the histories of provinces and cities. One of the oldest and best of these is the Provincial Museum of the Mark of Brandenburg in Berlin. Of the same class are the Museum of the City of Paris in the Hotel Canavelet, and the Museums of the City of Brussels and the City of Antwerp.

Others illustrate the early history of a race or country, such as the Musée Gallo-Romain at St. Germain, the Romano-German Museum at Mainz, the Etruscan Museums at Florence and Bologna, the Ghizeh Museum near Cairo, the Acropolis Museum at Athens, and the Museums at Constantinople.

Such institutions as the Bavarian National Museum at Nuremberg and the German National Museum in Munich have to do with later periods of history, and there are throughout Europe numerous collections of armor, furniture, costumes, and architectural and other objects, illustrating the life and arts of the middle ages and the later periods, which are

even more significant from the standpoint of the historian than from that of the artist. Important among these are the Royal Irish Academy at Dublin, and the Musée des Thermes—the "Cluny Museum"—in Paris.

Many of the cathedrals of Europe are essentially either Civic or National Museums, and such edifices as Saint Paul's and Westminster Abbey belong pre-eminently to the latter class.

There are Biographical Museums, either devoted to single men, like the Galileo, Dante, and Buonarrotti Museums in Florence, or the Goethe Museum in Weimar, and the Beethoven Museum in Bonn; to the great men of a nation, as the National Portrait Gallery of Great Britain, the German Valhalla at Ratisbon, etc.; or to great men of a special profession, such as the Gallery of Artists in the Pitti Museum of Florence.

In this connection would come also collections of autographs and manuscripts (like the Dyce-Forster Collection at South Kensington), and collections of personal relics.

Midway between the Museum of History and that of Biography stands the Dynastic or Family Museum, such as the Museum of the Hohenzollerns in Berlin, and that section of the Kunsthistorisches Museum in Vienna which illustrates the history of the Hapsburg. The Musée Historique de Versailles is similar in its aims.

C.—ANTHROPOLOGICAL MUSEUMS.

1. The Museum of Anthropology includes such objects as illustrate the natural history of Man, his classification in races and tribes, his geographical distribution, past and present, and the origin, history and methods of his arts, industries, customs and opinions, particularly among primitive and semi-civilized peoples.

2. Museums of Anthropology and History meet on common ground in the field of Archæology. In practice, Historic Archæology is usually assigned to the latter, and Prehistoric Archæology to the former. This is partly because Historical Museums, which are usually national in scope and unsupported on documentary evidence, treat the prehistoric races as extralimital; partly because prehistoric material is studied to best advantage through the natural history methods in use among anthropologists but not among historical students.

COMMENT.—Ethnographic Museums were proposed half a century ago by the French geographer Jomard, and the idea was first carried into effect about 1840 in the establishment of the Danish Ethnographical Museum. In Germany, there are Anthropological Museums, in Berlin, Dresden and Munich, and the Museum für Volkerkunde in Leipsic ; in Austria, the Court and the Oriental Museums in Vienna ; in Holland, the Ethnographical Museum in Leyden, and smaller ones in Amsterdam, Rotterdam and at The Hague ; in France, the Trocadero ; in Italy, the important Prehistoric and Ethnographic Museums in Rome and Florence ; in Spain, the Philippine Collections in the Museo de Ultramar in Madrid ; and in Hawaii, the Bernice Pauahi Bishop Museum, at Honolulu.

In England less attention has been given to the subject than elsewhere in Europe, the Christy Collection in the British Museum, the Pitt Rivers Collection at Oxford and the Blackmore Museum at Salisbury being the most important ones specially devoted to ethnography. In the United States, the Peabody Museum of Archaeology in Cambridge, the collections in the Peabody Academy of Sciences at Salem, and the American Museum of Natural History in New York are arranged ethnographically, while the ethnological collections in the National Museum in Washington are classified on a double system,—one with regard to race ; the other, like the Pitt Rivers Collection intended to show the evolution or development of culture and civilization without regard to race. This broader plan admits much material excluded by the advocates of Ethnographic Museums, who devote their attention almost exclusively to the primitive or non-European peoples.

Closely related to the Ethnographic Museum, are others devoted to some special field, such as the Musée Guimet in Paris, which is intended to illustrate the history of religious ceremonial among all races of men, a field also occupied by one department of the National Museum in Washington. Other good examples of this class are some of those in Paris, such as the Musée de Marine, which shows not only the development of the merchant and naval marines of the country, but also, by trophies and other historical souvenirs, the history of the naval battles of the nation ; and the Musée d' Artillerie, which has a rival in Madrid.

Of Musical Museums, perhaps the most important are Clapisson's Musée Instrumental in Paris ; that in Brussels and that in the National Museum at Washington. The collection of musical instruments at South Kensington has had its contents selected chiefly with reference to their suggestiveness in decorative art.

The Theatrical Museum at the Académie Français in Paris, the Museum of Journalism at Antwerp, the Museums of Pedagogy in Paris

and St. Petersburg, are professional rather than scientific or educational, as are also the Museum of Practical Fish Culture at South Kensington, the Monetary Museum at the Paris Mint, the Museums of Hygiene in London and Washington, and the United States Army Medical Museum.

The value of archaeological collections, both historic and prehistoric has long been understood. The Museums of London, Paris, Berlin, Copenhagen and Rome need no comment. In the Peabody Museum in Cambridge, the American Museum in New York, the Museum of the University of Pennsylvania and the National Museum in Washington are immense collections of the remains of prehistoric man in America.

3. There are many objects now in the custody of Art Museums, which would be more appropriately placed, if in the Museums of Anthropology or History.

COMMENT.—There are special collections on the boundary line between art and ethnology, the manner of best installation for which has scarcely yet been determined. The Louvre admits within its walls a Museum of ship models. South Kensington includes musical instruments, and many other objects equally appropriate in an ethnological collection. Other Art Museums take up art and armor, selected costumes, shoes, and articles of household use. Such objects, like porcelains, laces, medals, and metal work, appeal to the Art Museum Administrator through their decorations and graceful forms. For their uses he cares presumably nothing. As a consequence of this feeling, only articles of artistic excellence has been saved, and much has gone to destruction which would be of the utmost importance to those who are now studying the history of human thought in the past.

On the other hand, there is much in Art Museums which might to much better purpose be delivered to the ethnologist for use in his exhibition cases. There is also much which the Art Museum, tied as it often is to traditional methods of installation, might learn from the scientific Museums.

Many of the arrangements in the European art collections are calculated to send cold shivers down the back of a sensitive visitor. The defects of these arrangements have been well described by a German critic, W. Bürger. "Our Museums," he writes, "are the veritable grave-yards of art in which have been heaped up, with a tumulous-like promiscuousness, the remains which have been carried thither. A Venus is placed side by side with a Madonna, a satyr next to a saint. Luther is in close proximity to a Pope, a painting of a lady's chamber next to that of a church. Pieces executed for churches, palaces, city halls, for a particular edifice, to teach some moral or historic truth, designed for some especial light, for some

well studied surrounding, all are hung pell-mell upon the walls of some non-committal gallery—a kind of posthumous asylum, where a people, no longer capable of producing works of art, come to admire this magnificent gallery of débris."

D.—NATURAL HISTORY MUSEUMS.

1. The Museum of Natural History is the depository for objects which illustrate the forces and phenomena of nature,—the named units included within the three kingdoms, animal, vegetable and mineral,—and whatever illustrates their origin in time (or phylogeny) their individual origin, development, growth, function, structure, and geographical distribution—past and present; also their relation to each other, and their influence upon the structure of the earth and phenomena observed upon it.

2. Museums of Natural History and Anthropology meet on common ground in Man. In practice, the former usually treats of Man in his relations to other animals, the latter of Man in his relations to other men.

COMMENT.—In most national capitals, there are general Museums in which collections representing the three kingdoms of nature are included in one group. Among the oldest and most prominent types of this class are the British Museum of Natural History in South Kensington and the Musée d' Histoire Naturelle in Paris, and there are numerous others in the great cities of both hemispheres.

Among specialized natural history collections, a good type is the Museum of Comparative Zoology in Cambridge, Massachusetts, founded by Agassiz to illustrate the history of creation, as far as the present state of knowledge reveals that history, which was in 1887 pronounced by Alfred Russell Wallace to be far in advance of similar institutions in Europe, whether as regards the general public, the private student, or the specialist.

Next in order after the Zoological Sections of the Museums in London and Paris, stands those of the Imperial Cabinet in Vienna; those in Berlin, Leyden, Copenhagen, Christiania, Brussels and Florence, and the La Plata Museum in Argentina, so rich in paleontological material.

The best type of the Botanical Museum is perhaps the Royal Garden at Kew, with its colossal herbarium and its special Museum of economic botany, both standing in the midst of great botanic gardens. The Royal Botanical Museum in Berlin and the herbaria of the Imperial Botanical Garden in St. Petersburg are other examples.

Of specialized Geological Museums, the Imperial Cabinet in Vienna is a good type. The Museum of Practical Geology in London, founded to exhibit the collections of the Survey of the United Kingdom, and also in order to show the applications of geology to the useful processes of life is another type of the same class. The Department of Economic Geology in the Field Columbian Museum of Chicago—an outgrowth of the Exposition of 1893—represents this idea in the new world.

Besides the great special Muséums, there are the Museums of local natural history, intended to show the natural history of a special region, or, it may be to illustrate its resources in some restricted branch.

The Royal Museum of Vertebrates in Florence, devoted to the vertebrate fauna of Italy, is a type of this class, and many local Museums are so prominent in some special field (such as ornithology or entomology), that their other activities attract little attention.

E.—TECHNOLOGICAL OR INDUSTRIAL MUSEUMS.

1. The Museum of Technology or Industrial Museum is devoted to the industrial arts and manufactures, including :

- (1). Materials and their sources.
- (2). Tools and machinery.
- (3). Methods and processes.
- (4). Products and results.
- (5). Waste products, and undeveloped resources.

The interests here treated are thus classified :

- (1). Primary or exploitative industries (as Agriculture, Mining or the Fisheries).
- (2). Secondary or elaborative industries (as the Textile industries, the Ceramic Industries).
- (3). Auxiliary industries (as transportation).
- (4). Technical professions (as Engineering, War, Medicine, Engraving).

The final product of one industry (primary or secondary) may become a material or tool in another art industry or handicraft.

2. Technological Museums come in contact with others as follows :—

with the Natural History Museum in respect to primary materials ;

with the Anthropological Museum in the matter of tools and processes, especially if historical and retrospective collections are undertaken ;

with the Art Museum in regard to certain products in which a high degree of æsthetic merit has been attained ;

with the Commercial Museum in respect to all products and materials used in commerce and manufactures.

3. There is no such thing in existence to-day as a General Technological Museum, conducted upon a liberal plan and doing useful educational work. The possibility of establishing such a Museum remain to be demonstrated. Attempts have been made at the close of various international expositions, but without success.

4. It is possible that experience may show that Museum work in this field can best be done in connection with Museums of Natural History and Anthropology, organizing sections of economic zoology in connection with Zoological Museums, economic geology and botany, respectively with the general botanical and geological collections. In this way, at least, the natural products and the crude materials could be disposed of to advantage, and the manufactured products, tools and processes, on the other hand, could be shown by the Museums of Anthropology and Art, and in connection with the Mechanical or Patent Museums; though after all a

factory in actual operation is the best place to study most modern industries. The constantly changing interests of commerce, dependent upon changing fashions and the caprice of markets might safely be left to the Exposition and Fair, or, if need be, cared for by commercial organizations. In the City of Philadelphia, for instance, there is a most permanent exhibition of objects and materials used in the construction and ornamentation of houses, kept by the "Building Trades' Association."

F.—COMMERCIAL MUSEUMS.

1. The Commercial Museum has to do with the salable crude material and manufactured articles; with markets, means of commercial distribution, prices, and the demand and supply of trade.

2. It properly may be connected with the Technological Museum, but for the fact that its purposes are likely to be more akin to those of the Exposition or Fair, involving a frequent renewal of exhibits in connection with commercial changes, and often certain features of competitive advertising or display on the part of private exhibitors.

3. The function of this class of Museums is two-fold :
(a). To exhibit to home producers the character and location of foreign markets.
(b). To exhibit to foreign buyers the location and products of the home producer.

4. Although the usefulness of the Commercial Museum has not yet been fully demonstrated, it is conceivable that it might be of great service, could it be made the medium of wide international communication, and the means of a comprehensive system of exchange, through

which the collections should be kept up to date and indicate the condition of the various markets of the world.

Essential to the success of such a Museum would probably be a bureau of information, through which practical knowledge concerning prices, shipment, and the quality of products, might be obtained by manufacturers and other interested persons, and samples distributed for use in experiment and comparison.

COMMENT.—Examples of Commercial Museums may be found in the Musée de Melle at Ghent ; that of the Chamber of Commerce at Liège, founded in 1888, and the Ottoman Commercial Museum established in 1890 at Constantinople. These are too recent, however, to afford many lessons.

G.—NATIONAL MUSEUMS.

1. National Museums contain the treasures belonging to National Governments and are legitimate successors of those treasure-houses of monarchs, princes and ecclesiastical establishments which until within the last two centuries were the sole representatives of the Museum idea. Every great nation now has a Museum, or a group Museums more or less liberally supported, and intimately connected with the educational undertakings of the Government ; often, when there are several great cities under one Government, each has its own system of Museums, and these form the national system.

2. In most countries of Continental Europe the collections of the national universities form a part of national Museum system and are exceedingly efficient when thus administered.

3. National Museums have opportunities which are not often shared by those under state control, and their responsibilities are correspondingly great. They should

occupy specially those fields which are not provided for in the other Museums of the country in which they exist, and should not only refrain from competition with these Museums, but afford to them unreserved co-operation.

COMMENT.—The principal purpose of a National Museum must be, as Jevons has well said, "the advancement of knowledge, and the preservation of specimens of works of art which hand down the history of the nation and the world."—In other words, to serve as Museums of record and research. It is by no means impossible, however, for them to render excellent service as educational Museums, and quite independent of other considerations, they can rarely afford to sacrifice the material advantages gained from engaging in educational work.

A serious obstacle to success in this direction is the vast amount of material which they all possess, and the lack of space in which to admit it. This difficulty may be partly overcome by a liberal assignment of objects to that portion of the study series which is not on exhibition.

A National Museum may not, it is true, advantageously attempt to install its separate departments in such manner as to produce the unity of effect possible in small specialized Museums. This, however, is due to the fact that they are obliged to classify their material more strictly, for the attractiveness of a specialized Museum grows largely from the fact that many illustrative objects are introduced into the exhibition series which are not strictly in place. The extreme attractiveness of fishery exhibitions, for instance, grows from the fact that so many interesting objects only incidentally connected with the fisheries may be introduced as a setting for the objects directly related to the fisheries.

A result of the same kind is obtained in the Museum of Practical Geology in London, where a selected series of products of all the arts deriving their material from the mineral kingdom—glass, pottery, gems, metal-work, and many similar groups are brought in, legitimately increasing the attractiveness of the Museum to the visitor and its instructiveness to the student.

Though the great general Museum cannot vie in this respect with the local Museum, it has a certain advantage of another kind in its very wealth of material, for the display of vast collections, assembled from all parts of the earth and covering it may be acres of floor space, strictly classified and arranged so as to show mutual relationships, affords in itself the most impressive lesson. While in smaller Museums the study of individual objects may be easier, in those of the other kind there is a better opportunity for the study of great general relationships.

H.—LOCAL, PROVINCIAL, OR CITY MUSEUMS.

1. To Museums of this class belongs the duty of preserving all that which is characteristic of the region or city in which they are located. Every state or province should have an institution of this kind to care for material illustrating its own geology, zoology, botany and archæology. Every city should have an historical collection for memorials of events in its history and that of its representative men.

2. It is legitimate and desirable that Local and Municipal Museums should also enter upon general Museum work of a scientific and educational character. They may form collections of a general character, in order that their visitors may see and study the unfamiliar products of foreign lands, as well as those of local interest. For Museums of this class, models, casts, copies and pictures of objects not actually obtainable, may be used.

3. It is often advantageous in small communities for the Museum and public library to be combined under one roof and one management.

I.—COLLEGE AND SCHOOL MUSEUMS.

1. Museums of this class are intended for the use of teachers in connection with their classroom and laboratory instruction and to re-inforce the library in the no less important work which it performs for the student.

2. It need scarcely be said that it is impracticable for the smaller teaching Museums connected with schools and colleges to carry out the thorough specialization which is attainable in large institutions. A small collection, however scanty and imperfect it may be, is of great value, not only for study purposes in connection

with some school or college and for exhibition to the local public of a small town, but also as a nucleus for future development.

3. The college or school Museum often becomes the local or city Museum for the locality in which it is situated, and what has been said about Museums of the latter class then becomes applicable to the College Museum.

J.—PROFESSIONAL OR CLASS MUSEUMS.

1. Professional Museums are those formed specially for the use of groups of specialists and for the education of specialists. Here belong medical, surgical and pathological Museums; military and naval Museums; mechanical Museums (such as those connected with patent offices, and the Conservatory of Arts and Manufactures in Paris); Museums for special arts (like the Textile Museum connected with the Gobelin establishment, the Museum of Porcelains in Sèvres, the Museum of Mosaics in Florence), and certain scientific Museums like that of the Geological Survey of Great Britain—the Museum of Practical Geology,—the Museo Psicologico in Florence, founded by Mantegazza, and many others.

2. Such institutions, usually under the control of a society, school or specialized bureau, although they may allow inspection by the public, do not necessarily undertake general educational work, but may with propriety consult first, in all matters relating to administration and display, the interests of the class for which they are formed.

K.—PRIVATE MUSEUMS OR CABINETS.

1. Such collections undertake work in only one portion of the Museum field—that of fostering scientific and

historical studies,—and so long as they are fruitful in this direction, the manner in which they are administered concerns only the persons by whom they are controlled. It is well that there should be many Museums of this kind, and that those who work in them should not be encouraged to dissipate their energies in attempting to do too much of the work which belongs to institutions of other classes and for which there should be held responsible. These are to all intents and purposes scientific laboratories.

2. The private collector is of the greatest service to the public Museum. He can, by the use of private wealth or individual freedom, do many things which the officers of a public Museum cannot.

3. The private cabinet is the school in which the Museum administrator forms the tastes and receives the preliminary training which fits him for his profession. There is much truth in the remark of Jevons that the best Museum is that which a person forms for himself. If everyone could do this there would be no need for public Museums, but since they cannot, the person who has formed a private collection ought to be able to manage one for the use of the public, since he better than anyone else is able, in considering the needs of the Museum visitor, to keep in mind that saying which is so useful a guide in Museum practice—"Put yourself in his place."

4. Private collectors should be encouraged for educational reasons also, for it has been frequently remarked that the men who have had in youth the training afforded by forming a collection have derived therefrom great advantage over others, even though they subsequently pursued commerce or the learned professions.

V.—THE USES OF SPECIMENS AND COLLECTIONS.

A.—THE USES OF SPECIMENS.

1. Specimens are like the types in a printing office. They may be sorted in the cases in convenient order, so as to be accessible when needed, and may be used to make intelligible almost any train of thought or series of ideas, each being available to hundreds of different relationships.
2. A Museum is rarely justified in exhibiting all its materials: as well might a publishing house insist upon using every piece of type in its possession in the printing of each book which it issues.
3. An exhibition-series, when properly installed and labeled, is usually most effective when limited in extent.
4. Such a series should not only be limited in extent, but also selected and arranged as to produce a certain unity of effect.

COMMENT.—This principle has been stated by Jevons, who writes: "There may be many specimens exhibited, but they ought to have some degree of relation that they may conduce to the same general mental impression. It is in this way that the Thorwaldsen Museum at Copenhagen exercises a peculiarly impressive effect upon the multitude of all classes of Danes and Swedes who visit it. This Museum contains in a single building almost the whole works of this great sculptor, Thorwaldsen, together with all the engravings and pictures having reference to the same. Very numerous though the statues and bas-reliefs are, there is naturally a unity of style in them, and the visitor as he progresses is gradually educated to an appreciation of the works. In somewhat the same way we may explain the ineffaceable effect which certain other foreign galleries produce upon the traveller, especially those of the Vatican. This is not due simply to the excellence of any particular works of art, for in the Louvre or the British Museum we may see antique sculptures of equal excellence, but in the principal Vatican galleries we are not distracted by objects belonging to every place and time. The genius of the classical age spreads around us, and we leave one manifestation of it but to drink in a deeper impression from the next."

The Museo delle Belle Arti in Sienna, the collections in the Monastery of San Marco in Florence, the Musée Gallo-Romain at St. Germain near Paris, the Museo Borbonico in Naples, the Musée des Thermes in the Hotel de Cluny, the German National Museum in Nuremberg, the Museo de Ultramar in Madrid, the Museum of Practical Geology in London, all have been successful in maintaining this unity of effect.

A noteworthy example of a Museum of limited scope in which unity of effect is sacrificed, is the Musée Guimet in Paris, although notwithstanding this effect it is one of the most interesting and beautiful small Museums in the world. In this instance it is evidently due to the fact that the original purpose of the Museum—which was to illustrate the comparative history of religions—has been modified by the admission of extensive collections illustrating the arts of the Orient, and that these are not separated in their installation from the religious collections.

Great National Museums are usually so hampered in the matter of space that they are not able to attain to such unity, and perhaps it is not equally important in these great establishments in which popular education is only one of several purposes.

5. Single or unrelated specimens, though valuable or interesting, are in themselves of little moment in comparison with series of much less precious objects which unite to teach some lesson to the student or visitor.

6. Specimens are often most useful when placed in a reserve or study series, to be used by special students or to be exchanged, or given to other Museums.

7. Advancement in a Museum is effected, not only by accession and enlargement, but by the constant substitution of better specimens for study and exhibition, by improvements in methods of display and labeling, and by publishing contributions to knowledge based upon the collections.

B.—THE STUDY SERIES.

1. The effectiveness of a Museum as an agency for the increase of knowledge and for higher education depends upon the maintenance of a study series, the administration of which should be upon a plan quite different from that employed for the exhibition series.

2. While it may be desirable to exhibit publicly many large or indestructible objects belonging to the study series, this series should be as a rule permanently arranged in laboratories and store-rooms not accessible to the general public.

3. The study-series is the storehouse from which the exhibition-series is replaced or extended, and from which the needs of other Museums may be supplied.

4. Objects of the following classes should never be placed in the exhibition series :

A. Those which are unique or very rare, and liable to destruction from exposure to light and dust.

B. Those which are the types of descriptions, except when large and indestructible.

C. Those belonging to series which are often required for purposes of comparison by students.

5. In collecting materials for the study series, the needs of the future as well as those of the present should be kept in view. Specimens in this series should therefore be acquired in quantities sufficiently large to meet the needs of students hereafter. While nothing of value should be lost, it is questionable, however, whether material should be sought in large quantity when there is no indication that it will soon be needed.

6. The fact that an object is common now is no indication that it will remain so, and the abundance of any kind of objects in a given locality, is often good evidence that it is rare in most other parts of the world.

7. Specimens in the study series, though hidden from sight, should be the object of care as solicitous as that bestowed upon the exhibition series, and should be available upon demand like the books in the stack-rooms of a library.

C.—THE EXHIBITION SERIES.

1. The "People's Museum" is that portion of a Museum which is on public exhibition: the "Student's Museum" that which is devoted to laboratories and lecture-rooms. The "People's Museum" should be much more than a hall full of specimens in glass cases. It should be a hall full of ideas, arranged with the strictest attention to system.

2. The ideas which a Museum is intended to teach, can only be conveyed by means of labels.

As I have said in a previous paper :

An efficient educational Museum may be described as a collection of instructive labels, each illustrated by a well-selected specimen.

3. The effectiveness of a museum *for the use of the public at large* depends chiefly upon the following considerations :

A. There should be a careful selection and effective arrangement of the specimens exhibited (which implies the exclusion of many objects in themselves attractive and interesting).

B. The specimens for exhibition must be chosen solely with reference to the lesson they can teach, singly or in combination.

C. *A small exhibition series, complete within its own limits, systematically arranged, fully labeled and effectively displayed, is far more useful than a vast collection exhibited without reference to its teaching power.*

D. *To complete a series, any specimen is better than none.*

E. A copy, model or picture of a good thing is often more useful than an actual specimen of a poor one.

F. A picture or model, may often be shown to advantage in place of a minute or unintelligible object.

g. Books, manuscripts, pictures, maps, etc., become specimens when treated in the Museum method.

h. There should be a *thorough system of labels*, written in simple language, supplemented by pictures, diagrams, maps and books of reference.

i. Cases, labels, colors of backgrounds, aisles, and all the practical details of arrangement, however minute, should be considered with the comfort and physical ease of the visitor in mind, since the use of a Museum is at best necessarily attended by fatigue of eyes and of body, which may be greatly lessened by the adoption of proper devices.

k. Installation ideals cannot be too lofty.

D.—CUMBERSOME AND SUPERFLUOUS MATERIALS
IN COLLECTIONS.

1. There are few objects which may not be used in Museum work. It does not follow, however, that any one Museum should attempt to include such objects. There are many which in the present stage of Museum practice may be entirely neglected. If any Museum were to be extended to the limits of its possibilities, a dictionary might be made to serve as an alphabetical index to its contents.

2. One of the chief perils to a Museum is the possession of vast collections.

3. Not the least important duty of the curator is to prevent the accession of undesirable material.

4. Material not germane to the plan of a Museum should be exchanged or given to the other Museums which have uses for it. What is expensive and unprofitable to one may be of the greatest value to another.

**E.—SYNOPTICAL AND SPECIAL COLLECTIONS
WITHIN MUSEUMS.**

1. Synoptical or Dictionary Collections are advantageous in Museums of every class. Their purpose is to teach some special lesson by means of a small or complete series of specimens, arranged, labeled and provided with all possible illustrative accessories.

A synoptical series with a full complement of descriptive labels forms for any science an elementary manual, the labels forming the text, the specimens the illustrations.

COMMENT.—A collection of this kind in a Natural History Museum may either illustrate the principles of classification and phylogeny, those of geographical distribution, or may deal with the problems of comparative morphology. One of the best of the latter classes is, that in the great central hall of the British Museum of Natural History, while an excellent type of the second class is the Museum of Comparative Zoology ; and of the first, that developed under the direction of Mr. Higgins in the Liverpool Museum.

Collections illustrating systems of crystallization and scales of hardness and color are found in many mineralogical cabinets.

Many of the best school Museums are practically synoptical collections, and this and nothing more is what they should always aim at.

2. In some collections there is a similar separation of certain objects with a less definite purpose,—as for instance in the well known Tribuna in the Uffizi Gallery in Florence : in many art Museums there is a similar effort to bring together their most valuable and famous possessions in one central hall.

3. There is no limit to the possibilites in the way of developing special collections, and such collections with judicious treatment, do more than anything else to add to the attractiveness and individuality of a Museum.

The collections of British birds in attitudes of life, mounted in the midst of their natural surroundings, at

South Kensington, is one of the most striking and memorable features in that Museum. A similar collection in the Museum of the University of Pisa, formed early in this century by Paolo Savi, though on a smaller scale, is no less prominent a feature of that smaller Museum. There are several special halls in the Museum at Naples—especially that containing the collection of burnt manuscripts from the buried city—which are unique. Numerous other examples might readily be cited.

F.—LOAN COLLECTIONS AND ITINERATING MUSEUMS.

1. Large Museums may greatly increase their educational effectiveness by lending special collections, well labeled and arranged, to towns not provided with Museum facilities, and by replacing these from time to time with others. This has been done with success by the Department of Science and Art in Great Britain, and it has resulted not only in a great improvement in the provincial Museums throughout the United Kingdom, but in the establishment of many new ones.

COMMENT—This system appears to have grown out of the suggestion made more than half a century ago by George Rennie, and others, to the Committee on Arts and Manufactures appointed by the House of Commons.

2. In the United States the same thing has been attempted in requiring the National Museum, as well as the several Departments of the Government at Washington, to exhibit in the great expositions which have been held from time to time in the principal cities. This method is much more costly than that employed in Great Britain, and it will scarcely be claimed that it is equally effective.

VI.—THE PRESERVATION AND PREPARATION OF MUSEUM MATERIALS.

A.—CONSERVATISM AND TRUTHFULNESS IN THE HANDLING OF MUSEUM MATERIALS.

1. It is not only essential that the full history, locality, original appearance, etc. of each specimen should be fully recorded, but that the specimen itself should be preserved from mutilation, distortion, and all other harm. Carelessness is the unpardonable sin in a Museum worker, and the officers in charge of valuable collections should be held to a strict accountability and if need be placed under bond, not only for the safety, but for the proper treatment of the treasures in their care. Preparators and taxidermists should be kept under the strictest surveillance.

B.—REPAIRS AND RESTORATION OF SPECIMENS.

1. Repairs are legitimate when necessary for the safety or permanent preservation of objects, for keeping together the parts of objects which have been broken, but in the interests of truth and science the fact that an object thus repaired should never be disguised.

2. This principle applies to natural history specimens, to archæological objects, and to works of art as well.

3. Restoration, or the replacing of missing parts, is rarely defensible when in the process of restoration any portion of the original object is covered up. Restorations made in such manner that the part restored is not at once distinguishable, are unpardonable. If it is necessary to restore missing parts, the restorations should be made upon a cast or model, and not upon the original.

COMMENT.—This principle has reference to Hypothetical Restorations. It is quite permissible to restore upon the original specimens, in Natural History collections, where there are in existence similar specimens from which further guidance may be obtained.

C.—COPIES.

1. Copies are available under certain limitations. Sculptures, coins, metal-work, many ethnographical objects, architectural models, and many products of the decorative and industrial art may be reproduced easily and inexpensively, and the copying of pictures though more difficult is still practicable. In natural history, as has already been said, only fossils can advantageously be reproduced by copies.

2. *A copy of an important object is always more desirable for educational use than an original of minor significance.*

D.—MODELS.

1. Models may also be used to represent objects which are unattainable, or from their magnitude or minuteness* unavailable. Models may also be used to replace alcoholic preparations, or in the place of pictures, when the latter are less effective. Aquatic invertebrates, fishes, reptiles, cetaceans, figures showing the races of mankind and abnormal and normal developments of the human body, and almost everything in the field of anatomy, osteology and embryology can be shown admirably by the use of models.

E.—PICTURES.

1. Pictures are often better than specimens to illustrate certain ideas. The races of man and their distribution, for instance, can only be shown by pictures and maps.

F.—BOOKS.

1. Certain kinds of books are more useful and safer in the Museum than on the library shelves, for in the Museum they may be seen daily by thousands, while in

* Where enlargements are employed it is well to place the actual objects by their side, to give an idea of the scale of enlargements.

the library their very existence is forgotten by all except their custodian. Books such as Audubon's "Birds of North America," Gould's "Humming Birds," and Owen Jones's "Alhambra," are a few among the numerous works of which everyone has heard and which everyone wants to see once in his lifetime. In a library they are probably not examined by ten persons in a year; in a Museum the volumes exposed to view in a glass case, and a few of the most striking plates attractively framed and hung upon the wall near at hand, teach a lesson to every visitor.

G.—THE MOUNTING OF ANIMALS.

1. Taxidermy is allied to sculpture and should be governed by the same canons of synthesis and repose. The attitudes of nature should be preserved, but action should be avoided except in the case of groups mounted in the midst of natural accessories, and even then action should never be violent. In mounting specimens to be arranged in the systematic series, the attitudes should always be simple and in some degree conventional and uniform.

H.—TYPES AND UNIQUES.

1. These should always be marked in some conspicuous and unmistakable manner, and if not placed in special cases, so labeled that their value may be understood by all.*

The safety of types should be provided for by special rules, and it is doubtful whether they should ever be allowed to leave the building in which they are deposited.

* In addition to the usual label, a wafer or painted spot of bright color, red, or green, greatly aids in making a type conspicuous.

2. In Zoology, Botany, or Mineralogy, a type is a specimen which has been described in giving a new specific name. Besides types of new species, there are equally valuable specimens which have served as the foundation of critical revisions or monographs of groups, which are equally deserving of special protection. Specimens which have been figured in standard works are subject to similar treatment.

I.—DUPLICATES.

1. A duplicate, from the Museum standpoint, is simply a superfluous specimen. A collection may possess scores of specimens at first view seemingly precisely identical, and yet not be able to spare one of them. Specimens can never be separated as duplicates until after the collection to which they belong has been exhaustively studied and the results of the study published. Even then there is danger in parting with them.

COMMENT.—The practice in the United States National Museum is to reserve from the material upon which a given memoir has been based, enough to render it possible to re-write the memoir from the beginning, if every copy should be destroyed.

2. In great Museums of research it is necessary and practicable to preserve extensive series of specimens, representing every possible variation and a great number of localities. In smaller Museums this cannot be done, except, it may be, in special fields, and the lesser Museums can usually throw a much larger proportion of specimens into the duplicate series.

3. The use of duplicates is for exchange and distribution. Their value when thus dispersed depends upon the most accurate identification and labeling, based upon comparisons with the reserve-collection from which they are taken.

VII.—THE ART OF INSTALLATION.

A.—INSTALLATION METHODS.

1. The arrangement and mounting of collections for exhibition, commonly known as their "installation," is an art worthy of serious attention on the part of every Museum officer. This art is allied to certain branches of architecture, especially that of interior decoration, but the services of an architect are not always to be had, and the man who is responsible for the arrangement of the halls and cases in a Museum should be able to do this work effectively. If a collection is to be exhibited at all, it should be done well, and I have little sympathy with my judicious friend who protested against the writing of this chapter on the ground that such "considerations of upholstery" are beneath the dignity of an institution of learning.

The success of installation, like that of every art, depends largely upon attention to minute details. Insignificant as they may seem, the slightest of these is as worthy of consideration, as that which seems to be the greatest.

2. Installation-work has to do with two matters : (a) the arrangement of halls and of cases, and other objects, with relation to the halls, light, and general effect ; (b) the construction and fitting of cases, and the arrangement of objects and labels within the cases. The form and arrangement of labels is also intimately connected with installation, but this will hereafter be discussed under the head of *labels*. (See VIII., A. 1—9, D. 3.)

B.—THE ARRANGEMENT OF HALLS.

Among the essential features of effective arrangement of floor space, are the following :

1. An arrangement in each hall, and especially in that which is first entered, which shall convey to the visitor

an impression of the character and aims of the Museum, and at the same time give an impression of repose, dignity, and beauty. The impression which the mind receives immediately after the first door has been passed, is always the strongest and most lasting.

2. A single entrance and one consecutive line of progress through the halls is most advantageous, both to administrator and visitor, and should be duly considered.

3. If the main, or circulation aisles, be wide and uninterrupted, and there are occasional broad spaces in front of important exhibits, the passages between the cases may be very narrow, provided the cases are built with this view.

4. The exhibits should be so arranged that their general features may be apprehended in a rapid stroll through the halls, while those wishing to study a special subject minutely may find the extended collections in close proximity to the landmark exhibits intended for the casual visitor. A striking exhibit at the end of a wide aisle may be used to draw visitors to a particular portion of the hall.

5. In the interest of good light and general effect, the lower cases and objects should be placed nearest the main aisles and the centre of the hall, while tall cases should be farthest from the eye.

6. In large halls, a system of alcoves with liberal aisles, or a double, triple, or quadruple system of circulation aisles may be used to advantage.

7. Transverse aisles are usually objectionable: when used, a wide, open area near the centre of the hall is advantageous. This may be enlarged so as to surround some striking and symmetrical pedestal-exhibit. (A formal case should never interrupt the course of an aisle).

Very wide aisles may often be advantageously divided by symmetrical and graceful pedestal-exhibits, by which the current of visitors is parted.

8. Objects too large to take their proper place in the cases may be declared "out of classification" and used decoratively, on the walls or pedestals, with cross-reference labels.

9. A small label, map or diagram at the eye level is as conspicuous as an immense one hung high on the walls. Such accessories should only be made large when needed for decorative uses and treated in a decorative manner.

10. These principles apply also to exposition installation, in which however an "open system" of installation is needed, with twice or thrice the floor space for the same material, that is required in ordinary Museum installation.

C.—CASES, AND THEIR ARRANGEMENT.

1. The function of a case or pedestal is to protect the exhibit, and to display it to the best advantage. Its character should be determined, not only by its intended use, but by the position in which it is to stand, the form of adjacent cases, direction and amount of light, &c. Cases should therefore be built only as need arises. They should be planned so that they can be used with advantage in halls that have light from overhead as well as from the sides. This precaution will simplify the problem of lighting at night.

2. Cases should not attract attention either by their austerity of design or workmanship, but should be simply appropriate and pleasing, well-locked, dust-tight and nearly air-tight. The frames should be as light and inconspicuous as possible: transverse bars across an exhibited object are unpardonable. Glass should be as

large, clear, and good as possible, for economy in glass is rarely true economy.

3. The space above the six-foot line is rarely of use, while for small objects nothing is gained by display below a height of thirty inches : large objects may be shelved at ten or twelve inches from the floor. Where the aisles are very wide, lower shelving for small objects is possible, but it is more economical to shelve high, narrow the minor aisles, and use the lower parts of the cases for storage-closets.

4. A system of interchangeable units in drawers and mounts, as well as in cases, is of the highest importance as facilitating the transfer of cases from hall to hall and saving cost in manufacture. This should include not only the exhibition cases, but those in the storage series as well.

5. Mobility is even more necessary. All floor cases and pedestals should have fixed rollers or roller trucks so that they may be moved with their contents, and all fixed cases should be built with screws so as to be readily moved from hall to hall.

6. Cases which permit a fixed installation and a recombination of units without a re-handling of specimens are economical and in many departments indispensable. Possibility of interchange of units between the exhibition and storage systems of cases is indispensable.

7. For the interior of cases, the prime need is that the system of shelving should be as flexible as possible, and that the inside colors should be restful to the eye and no lighter in color than the necessity of illumination may require.

7. The mountings for individual specimens should not attract the eye either by beauty or ugliness, but should support and set off the specimens, and by their uniformity

and propriety add to the appearance of system and order in the exhibits.

3. The inscription should be so attached that it cannot be removed or effaced, and, when possible, engraved or painted upon the object itself. When a mark of this kind is not possible, a ticket or label, preferably the latter, should be attached in the most prominent manner. Even when a ticket is used, at least the catalogue number should be inscribed upon the specimen, if this can be done without injuring it. These requirements do not apply so much to large and heavy objects permanently installed in an exhibition series, as to those kept, even temporarily, in a study or storage series. Fragile objects, or those which cannot receive a permanent mark, should be kept in type receptacles of glass or other material, upon which should be placed the inscription. Even when preparations are thus kept in jars or boxes, they should when possible, have some ticket attached to them bearing the same number as the receptacle in which they are placed, so that if specimens are taken out they shall not be put back in the wrong receptacle.

COMMENT.—In the United States National Museum, each alcoholic preparation is marked with a ticket of block tin, on which the catalogue number is stamped, the same number being engraved with a diamond upon the glass jar in which it belongs.

4. A specimen may consist of a single object, or of a large number of similar objects from one source. For instance, a collection of engravings in one portfolio; a collection of similar kinds of stone implements from one excavation; a number of animals or plants of one species, from the same locality.

For lack of a better term, the material included in a Museum catalogue, number, whether a single specimen

or many, is called a "lot." This term is chiefly employed in Museum statistics.

5 Explorers and collectors in the field should keep their records by catalogue and label, in accordance with the principles laid down for Museums. Their work thus gains immensely in definiteness and value, and their temporary labels, catalogue numbers and registers, are easily brought into relation with those of the permanent Museum series. Private collectors, no matter how small their field of activity, are in duty bound to follow the same methods of record.

6. The principles crudely stated above may require modification, but the fundamental ideas are applicable to collections of every kind, public and private; and the owner of any interesting object, be it picture, manuscript, decorative object, or heirloom, should be urged to label his possessions for the benefit and protection of posterity.

7. What is inscribed upon the specimen is properly a "mark," what is attached to it upon a card or its equivalent is properly a "label." The term "etiquette," used in France, Germany, and upon the continent generally, is equivalent to our "label." But neither the term "etiquette" nor its equivalent "ticket," though the last is allowable in the same sense as "label," are often used by those who speak English.

In practice, it is convenient to speak of the inscription which serves to identify an individual specimen, whether inscribed upon it or attached to it, as its "label." Thus the individual or "specimen label" should be clearly distinguished from the "exhibition label," which has quite a different function and which ought to have a more distinctive name.

VIII.—RECORDS, CATALOGUES AND SPECIMEN LABELS.

A.—MUSEUM RECORDS.

1. The value of a collection depends in the highest degree upon the accuracy and fulness of the records of the history of the objects which it contains.
2. A Museum specimen without a history is practically without value, and had much better be destroyed than preserved.

COMMENT.—There will be many legitimate exceptions to this rule, but it can do no harm to state it forcibly, since the Museum Curator is more likely to err on the side of saving too much.

B.—CATALOGUES OR REGISTERS.

1. A Museum catalogue is a numerical list or *Register* in which each specimen is recorded, under a separate number, in connection with which are entered all the facts known in regard to its history.
2. The catalogue should be supplemented by a file-case, in which should be preserved notes, letters, or papers, relating to each specimen classified under the catalogue number.
3. The numerical *Register* may advantageously be supplemented by card catalogues systematically arranged.
4. In a large Museum, or one of a varied character, it is desirable that there should be separate catalogues or Registers for the several departments, each with a separate series of numbers.
5. When a Museum has a system of departmental catalogues, there should be a general catalogue, or *Accession Book*, in which “accessions” are entered in the order of their reception. The term “accession” is used to describe the material received at one time, from one source, whether it be a single specimen or a shipload.

In connection with the *Accession Book* should be filed, under the "accession numbers," all invoices and correspondence relating to the special accession.

In each departmental catalogue a separate column should be provided, in which the accession number should be recorded. A large number of specimens in many departments may fall under one accession number.

6. There is much advantage in printing the catalogues of a Museum. When a collection is sufficiently rich in material to afford the opportunity for a scientific revision and classification of the science which it illustrates, the advantage is very great indeed, as is demonstrated by what the British Museum has accomplished.

7. When great general catalogues are not practicable, much advantage is gained by printing catalogues of special collections, however small they may be, provided that each is complete in its own field. A report, or memoir, upon a special collection may be made to serve the purpose of a special catalogue.

When printed catalogues can be well illustrated their usefulness is increased many fold, since by this means the treasures of one Museum are made available for study and comparison in every other Museum, as well as by the multitudes who have not the opportunity to see the Museums in person.

8. *Catalogues are the keys to the treasure-vaults of a Museum.*

C.—SPECIMEN LABELS, OR TICKETS.

1. The inscription which is inseparably affixed to each individual specimen is the most essential part of the Museum record; for this not only establishes the identity of the specimen but serves to show to what Museum it belongs. Registers and other records may burn, but the

individual label will remain as long as the specimen itself, to give to it authenticity and significance.

2. The inscription should not only refer definitely to the register by means of the catalogue number, but should if possible, contain a statement of locality, and the name of the collector or maker.

IX.—EXHIBITION LABELS AND THEIR FUNCTIONS.

A.—THE PURPOSE OF THE EXHIBITION LABEL.

1. The exhibition label is the principal means by which the treasures in a Museum are made intelligible to the public : the guide, the lecturer, and the published handbook, though each in a limited field more effective, being absolutely powerless when the needs of the great majority of students and visitors are concerned.

2. The labels describing the specimens in a collection are intended to take the place of the Curator of the collection when it is impossible for him personally to exhibit the objects and explain their meaning. When collections were small and visitors few, the Curator or owner of a cabinet was accustomed to conduct visitors in person among the cases, to take the specimens in his hand, to tell their names and where they came from, to indicate features of special interest, and to answer questions. This was in some respects an ideal way, when the Curator was a man of wide knowledge and so much of an enthusiast that he took pleasure in talking without limit. The method was not without defects, however, since the lecturer (for such he was in fact) selected for exhibition a limited number of objects which interested him, or which he supposed might interest the visitors, and gave the latter no chance for selection. Furthermore, the arrangement could not be such as to convey a sequence of ideas, such as a selected and well-

labeled series of specimens can do, and the spoken descriptions, being as a rule full of unfamiliar words, were not remembered. The printed label may be read over again and again, and is often copied into the visitor's notebook. Again, under the old system, examining a collection was looked upon rather in the light of amusement than study, and what might have been possible in the way of instruction was rarely attempted.

In these days, when the Curator attempts verbal instruction, it is by means of a lecture in the Museum lecture hall or, if a floor lecture, among the cases, surrounded by hundreds or scores of auditors, who may either take notes, or find the substance of the lecture in a syllabus or printed text-book prepared by the lecturer.

Where one Museum visitor listens to the Museum lectures, tens of thousands pass through the halls without a guide. They must depend entirely upon the labels for information; for guide books, if such have been printed, are rarely bought, still more rarely used in the presence of specimens, and though often taken home with the intention of studying them, are only in the rarest instances ever opened after leaving the Museum.

3. The function of a label then is a most important one, since it is practically only through the aid of the labels that visitors derive any benefit whatever from a visit to a Museum. Therefore—

A LABEL SHOULD ANSWER ALL THE QUESTIONS WHICH ARE LIKELY TO ARISE IN THE MIND OF THE PERSONS EXAMINING THE OBJECT TO WHICH IT IS ATTACHED.

4. The office of the descriptive label may be stated as follows :

A. The label must tell the name of the object ; its exact and technical name always, and if there be one, its common name.

b. It must call attention to the features which it is important for the visitor to notice.

c. It must explain its meaning and its relations to the other objects in the same series. If it is a natural history specimen, it should explain its geographical distribution which if possible, should be plotted on a small map, forming a part of the label, and mentioning peculiarities of structure or habit.

If it is an ethnological object, its uses and construction should be explained, its materials named, if they are not obvious, and supplementary information given by means of pictures ; and where pictures are better than words, these may be attached.

d. The exact locality, date of collection, and source of the specimen exhibited, should be mentioned.

e. For the convenience of visitors it is well, in many cases, to give the dimensions or weight of the specimen.

5. The label may be made to convey much information in addition to that which is printed upon it, by means of maps, pictures, and diagrams, which may be placed by its side to reinforce its teachings, and also by cross references to other specimens in the Museum, or to books on the Museum reading tables, or in its library.

6. Exact references from the label to the specimen which it explains may be effected by a system of reference numbers, such as are used to bring a diagram into relation with descriptive text.

Colors may be applied to portions of a specimen, in order to make the label system more intelligible ; as for instance, when it is desired to compare similar parts in a series of specimens placed side by side, the same color in each signifying homology.

And "pointers" may be used upon the specimens to indicate the localities of small objects, or especially noteworthy features referred to on the label.

COMMENT.—The late Professor Moseley was one of the first to adopt these methods, in the Oxford Museum. The system of showing homologies by color was used in the Milan Museum as early as 1878, and has been very effectively used by Mr. F. A. Lucas in the United States National Museum.

B.—THE ART OF LABEL WRITING.

1. The preparation of labels is one of the most difficult tasks of the Museum man. The selection of the descriptive matter to be printed requires the best of judgment and the widest and most accurate information; while to determine the form and size of the different labels in a series, and to secure the best typographic effect, is equally difficult, and requires abilities of quite a different order.

2. A label may contain a vast amount of exact and valuable information, and yet by reason of faulty literary and typographic arrangement, have as little significance and value as a piece of blank paper.

3. Before a specialist is prepared to label a collection, he must be a complete master of the subject which the collection is intended to illustrate. After he has written the series of labels, if the collection is complete, he will have the material under control which would enable him to write a very complete book of reference upon the subject.

4. No task is more exacting than this form of *précis* writing. Not only is it impossible to conceal lack of perfect knowledge, but the information must be conveyed in a terse, concise and definite phraseology, such as is not demanded by any other class of writing, unless it may be the preparation of definitions for a dictionary. He who writes definitions for a dictionary, however, has usually the advantage of having before him numerous

other definitions of the same term which he needs only to collate and re-arrange.

5. A good descriptive label should do something more than impart information. It must be so phrased as to excite the interest of the person who is examining the specimen to which it is attached ; to call his attention to the points which it is most important that he should observe; to give him the information which he most needs while looking at the specimen, and to refer him to the books by means of which he can, if so disposed, learn all that is known upon the subject illustrated.

6. The art of label writing is in its infancy, and there are doubtless possibilities of educational results through the agency of labels and specimens which are not as yet at all understood. It is clear, however, that the advice of the old cook in regard to making soup applies equally well to a good label ; that "its merit depends much more on what you leave out than on what you put in." The value of this method of instruction is perhaps better understood by the most advanced writers of school text books and dictionaries than even by the average Museum worker.

COMMENT.—In Dr. Edward Eggleston's new "School History of the United States" engravings, portraits, pictures of historical localities, costumes, and archaeological objects, are interspersed through the text, and each of these has a label of the Museum type surrounded by rules and separated from the text, with which it has usually only general relationship. The originals which are thus illustrated, if brought together would make an admirable Museum of American history, and the book itself could hardly be improved upon as a handbook to such a collection. The modern illustrated dictionary owes much of its success to the adoption of Museum methods, due perhaps to the fact that so many men familiar with Museum methods have been engaged upon the preparation of the latest American publication of this kind, the *Century Dictionary*, and the more recently published *Standard Dictionary*. These works thus impart instruction by methods very similar to those in use in Museums, except that they are much at a disadvantage by reason of their alphabetical

arrangement. This is, of course, one respect in which the Museum exhibition case has the advantage over the lecturer, who can only present one subject at a time, or over the writer of books, who is prevented by the size of his pages from bringing a large number of ideas into view at once. This difficulty has been in part overcome by the editor of the *Standard Dictionary*, in the great plates where are shown in one case all the principal varieties of precious stones; in another plate, all the races of the domesticated dog; in another, the badges of orders of chivalry. Even this, however, is far from reaching the possibility possessed by the Museum, with its broad expanses of exhibition cases, of showing a large number of objects so arranged as to explain their mutual relationship, and so labeled as to explain the method of arrangement.

C.—FORM AND SIZE OF LABELS.

1. The size and typography of the label are of the greatest importance. The best written label may be ruined by the printer; not only must the letters be large enough to be legible from the customary point of view, but the type must be pleasing in form, and so arranged as to lead the eye of the reader with pleasure from one line to another, and so broken into paragraphs as to separate from each other the topics discussed.

Furthermore, a system of subordinate sizes of type is essential, so that the most important facts shall first meet the eye. In many of the labels printed for the National Museum, type of four or five different sizes is used, the largest giving the name of the object, the next size the name of the locality and donor, the next its distribution, and so on, much in the order of importance of the topics already proposed, while the least essential illustrated matter at the bottom of the label is placed in the smallest type. The theory is that the largest type should give the information desired by the greatest number of visitors (by everyone); the next size, that needed by those who are studying the collection in a more leisurely way, and so on.

Too much cannot be said of the necessity of breaking the descriptive matter into short paragraphs, which should never be more than half-a-square in length.

COMMENT.—Where a label of great width is printed, it is believed that it is better to arrange the matter in two columns rather than to weary the eye by following back and fro across the card. Labels, as a rule, seem to be most satisfactory when nearly square, or with the height less than the width.

2. Much attention should be given to the selection of type and color for labels, it having been found that labels printed on white cardboard become dirty or turn yellow, besides being dazzling and hard to read. Many tints of cardboard which would otherwise be available cannot be used, because of their tendency to fade—objectionable in itself, and doubly objectionable when it becomes necessary to put a fresh bright label by the side of one which has become soiled in use.

Almost every sample of colored cardboard which has been tried in the United States National Museum has faded after a time. The most satisfactory has been one of greenish gray. This is temporarily in use in the Geological and Mineralogical collections, where a light gray color for the interior of the cases and shelves seems preferable, and also in the collection of birds, which is installed by preference in a somewhat dark apartment. The standard label board, however, is a heavy rough-faced manilla. The color being that natural to this fibre is unchangeable. There is no fading, little tendency to become dirty, and the soft, rich, brownish-yellow tone sets off admirably the heavy black lines of the antique-faced type which is used, and harmonizes well with the buffs and maroons which are favorite colors for case interiors. Cartridge paper in any tint of gray or light brown is an admirable material for labels, especially large ones. It must, however, be glued to a tablet. If this is made of dark wood with a bevel retreating from the edge of the label, forming a dark border, the effect is very pleasing. Labels thus prepared and mounted upon metal rods are used by the National Museum for general classification labels in the interior of cases.

D.—CLASSIFICATION LABELS.

1. In addition to the labels of individual objects there are "classification labels" which serve the same purpose as the volume, chapter, section and paragraph headings in a printed work.

For the smaller groups these are placed inside of the case, for the larger ones outside, often serving as "case labels."

2. The relationship of the objects in a series to each other may usually be indicated by the size of the labels, which should be uniform for objects of the same general character in the same case. When a deviation from this rule is necessary, if the size of the type remain the same, more space may be obtained, either by slight widening or slight lengthening; but in the same series, it should be always lengthened or always widened. Classification labels, which are placed unattached among the specimens, increase in size with the importance of the grade of that case.

3. There are limits to the possibilities of making labels speak by their size. An object at the top of a case, or on a pedestal, or in a case by itself, is always regarded as "out of classification," and its label arranged solely with reference to its appearance or utility in the place where it is to stand. It is necessary to vary the size somewhat in the same series, when, as in a long case of mammals, a small species and a large one are placed side by side. Here, for æsthetic reasons, the rule is usually set aside.

COMMENT.—It is the plan in the United States National Museum to have a large label, glazed and framed, at the top of each case or in front of each panel. These are printed on black or maroon paper in gold or silver letters. The labels in gold or black are printed from large wooden type, and are used to indicate the general system of classification of the cases upon the floor. When it is desired to use outside labels, glazed and

framed, which are not in this general classification series, we print with heavy-faced type in black upon manilla or cartridge paper, since the black upon yellow is more legible with comparatively small type than the gold upon black.

X.—GUIDES AND LECTURERS ; HAND-BOOKS AND REFERENCE-BOOKS.

A.—GUIDES AND LECTURERS.

1. In the days when Museums were small and visitors few, it was possible, as has already been said, for a Curator of a collection personally to conduct the visitors and to explain to them the collections ; but this can no longer be done under the changed conditions. The label and the hand-book have for ever replaced the guide, for an unintelligent leader can effect nothing but harm.

2. A modification of the guide system is still practicable under certain circumstances, as when a party of persons interested in some special subject are conducted through a portion of a Museum by a teacher or some member of the Museum staff who serves in this capacity. This is the floor-lecture system, which, however, to be efficient must be coupled with some method of excluding the general public from the alcove in which the party is for the time engaged.

3. Formal lectures in the lecture hall of the Museum, illustrated by specimens withdrawn from the cases, are exceedingly useful, although they reach but a limited number of persons. Such lectures are most useful when in courses and devoted to a special topic ; still better when they are addressed to a particular class in the community, as for instance the teachers in public schools.

COMMENT.—The courses carried on at the American Museum of Natural History in connection with the Normal School system of the State of New York are an example.

4. In university towns, the use of the lecture room and the illustrative resources of the Museum may to good advantage be placed at the disposal of the professors and their classes.

5. A member of the staff may sometimes do good service by inviting a group of visitors to his laboratory, in order to explain with the use of specimens and reference books some special point upon which they seek information.

B.—HAND-BOOKS AND GUIDE-BOOKS.

1. The hand-book and guide-book supplement the label system, and used in connection with labels, render still more unnecessary the services of a guide.

2. The guide-book, properly speaking, is a brief manual in which the plan of the Museum and the general character of its contents are described. It should have diagrams of buildings, showing the location of the various halls and their uses, and diagrams when necessary of the halls, showing the system of arrangement. The guide-book in short, is a general label for the Museum as a whole. Since guide-books are usually kept as souvenirs, they should contain a certain amount of descriptive and historical matter, and pictures of the building and of some of its most notable treasures.

3. The hand-book relates to a portion of the Museum; either a *département* or a special collection within the department, and should present the information conveyed by the exhibition labels belonging to the branch to which it relates.

When a collection has been well labelled, a complete hand-book may be made simply by combining the labels in proper order and printing them. If the collection is complete and well selected, the hand-book describing

it becomes an encyclopædic manual of the subject illustrated.

Printed catalogues, such as have already been referred to, often fulfil the function of hand-books, though usually too technical for that purpose.

The catalogue should be technical and exhaustive, and adapted for the use of the professional student. When it relates to a large collection, and especially when illustrated, it is too large to be convenient for general use.

A hand-book is usually intended for the use of the public and should be what its name signifies—a volume which may be carried in the hand by the visitor or general student.

The hand-book also serves to remind the visitor of what he has seen, and enable him to review the teachings of the Museum after he has left it; it supplements, and to some extent replaces the visitor's personal note-book.

4. The hand-book and guide-book should never replace the descriptive label attached to each exhibited object. The practice not uncommon in art galleries and expositions of designating objects by number and describing them only in the guide-book does not seem judicious, although in temporary exhibitions it cannot always be avoided. It is a relic of the days when it was thought legitimate by this means to force every visitor to buy a catalogue, and thus contribute to the revenues of the establishment.

C.—READING TABLES.

1. A certain number of bibliographies, dictionaries, and standard works of reference, directing visitors to the literature of the subject, should be placed in each hall, each table being devoted to the subject illustrated by the collections in the midst of which it stands. These

books may, for safety, be fastened to a reading desk or table.

2. It is often advantageous to display books within the exhibition cases, with the specimens, to teach visitors what books they should use in carrying on the studies suggested by their visit to the Museum.

D.—LIBRARY.

1. Every well appointed Museum should have a good reference library which should include the principal books of reference in regard to the various specialties with which it is concerned, and especially the great illustrated works relating to other museums, which cannot be displayed in the exhibition halls. This library should be freely accessible to visitors and provided with comfortable furniture and facilities for taking notes.

2. The Museum library should, if possible, be so situated as to form one of the features of the Museum, and the doors so arranged that visitors can look in without disturbing those who are reading. The effectiveness of such an arrangement will be appreciated by all who have visited the Musée Guimet in Paris, or the Museo di Ultramar in Madrid.

3. In addition to the general reference library, special collections of books may advantageously be developed in connection with the several departments of a Museum. So long as these are judiciously limited in scope, they cannot well be too extensive, since a technical library is always more useful when it is more directly under the influence of a specialist, than when administered as a part of a great general library, by professional librarians. In a library of this kind, much material not usually of much service elsewhere, pamphlets, cuttings, pictures,

technical manuscripts, &c., will accumulate, and be kept under control.

COMMENT.—In the United States National Museum, there are a considerable number of sectional libraries, shelved in proximity to the collections to which they relate, and under the direct care of the Curators. These are all under control, by means of a card catalogue, kept in the central library, where works of general interest are retained, and may be recalled at any moment by the Museum librarian.

XI.—THE FUTURE OF MUSEUM WORK.

A.—THE GROWTH OF THE MUSEUM IDEA.

1. There can be no doubt that the importance of the Museum as an agency for the increase and diffusion of knowledge will be recognised so long as interest in science and education continues to exist. The prediction of Professor Jevons in 1881, that the increase in the number of Museums of some sort or other must be almost co-extensive with the progress of real popular education, is already being realized. Numerous local Museums have been organized within the past fifteen years in the midst of new communities. Special Museums of new kinds are developing in the old centres, and every university, college, and school, is organizing or extending its cabinet. The success of the Museums Association in Great Britain is another evidence of the growing popularity of the Museum idea, and similar organizations must of necessity soon be formed in every civilized nation.

2. With this increase of interest there has been a corresponding improvement in Museum administration. More men of ability and originality are engaging in this work, and the results are manifest in all its branches.

The Museum recluse, a type which had many representatives in past years, among them not a few eminent

specialists, is becoming much less common, and this change is not to be regretted. The general use of specimens in class-room instruction and still more, the introduction of laboratory work in higher institutions, has brought an army of teachers into direct relations with Museum administration, and much support and improvement has resulted.

3. Museum administration having become a profession, the feeling is growing more and more general that it is one in which talents of a high order can be utilized. It is essential to the future development of the Museum that the best men should be secured for this kind of work, and to this end it is important that a lofty professional standard should be established.

B.—PUBLIC APPRECIATION OF THE MATERIAL VALUE OF COLLECTIONS.

1. The Museum of Nature or Art is one of the most valuable material possessions of a nation or a city. It is, as has well been said, "the people's vested fund." It brings not only world-wide reputation, but many visitors and consequent commercial advantage. What Alpine Scenery is to Switzerland, Museums are to many neighbouring nations. Some one has written that the Venus of Melos has brought more wealth to Paris than the Queen of Sheba brought to King Solomon, and that but for the possession of their collections (which are intrinsically so much treasure) Rome and Florence would be impoverished towns.

This is thoroughly understood by the rulers of modern Italy. We are told that the first act of Garibaldi, after he had entered Naples in 1860, was to proclaim the City of Pompeii the property of the nation, and to increase the

appropriation for excavations so that these might be carried on with greater activity. "He appreciated the fact that a nation which owns a gold mine ought to work it, and that Pompeii could be made for Naples and for Italy a source of wealth more productive than the gold mines of Sacramento." If capital is an accumulation of labour, as economists say, works of art which are the result of the highest type of labour must be capital of the most productive character. A country which has rich Museums, attracts to itself the money of travellers, even though it may have no other source of wealth. If, besides, the populace is made to understand the interest which is possessed by their treasures of art, they are inspired with the desire to produce others of the same kind, and so, labour increasing capital, there is infinite possibility for the growth of national devoted to the formation of Museums, to their maintenance, and to the education of the people by this means.

Suggestive in this same connection was the remark of Sir William Flower to the effect that the largest Museum yet erected, with all its internal fittings, "has not cost so much as a single fully-equipped line of battle ship, which in a few years may be either at the bottom of the sea or so obsolete in construction as to be worth no more than the material of which it is made."

COMMENT.—This principle was well stated more than half-a-century ago by Henry Edwards in his treatise on the "Administrative Economy of the Fine Arts in England," as follows: "In addition to the broad principle that public funds can never be better employed than in the establishment of institutions tending at once to refine the feeling and to improve the industry of the whole population, there is the subordinate but yet important ground of inducing and enabling private persons greatly to benefit the public by contributing towards the same end." "No country," he continues, "has more cause to be proud of that munificent spirit of liberality which leads private individuals to present or bequeath to the community valuable collections which it has been the labour of

their lives to form ; but to give due effect to this liberality and to make that effect permanent, it is necessary that the State step in and contribute its sanction and its assistance ; and in many cases the very munificence of spirit which has formed an immense collection, and given birth to the wish to make it national, has, by its own excess made that wish powerless without the active aid of the legislature. The actual cost, and still more the inherent value, of the collections of Sloane, Elgin, and Angerstein, made them in reality gifts to the nation, although they could never have been acquired (without gross injustice to the descendants of the large-minded collectors), had not Parliament made certain pecuniary advances on account of them. Whilst but for the foundation of the British Museum and of the National Gallery, the collections of Crache-rode and Holwell Carr, of Beaumont, of Sir Joseph Banks, and of King George III. would have continued in the hands of individuals.

C.—PUBLIC APPRECIATION OF THE HIGHER FUNCTION OF MUSEUMS.

1.—Museums, libraries, reading-rooms and parks have been referred to by some wise person as “ passionless reformers,” and no better term can be employed to describe one of the most important of their uses.

COMMENT.—The appreciation of the utility of Museums to the great public lies at the foundation of what is known as “ the modern Museum idea.” No one has written more eloquently of the moral influence of Museums than Mr. Ruskin, and whatever may be thought of the manner in which he has carried his idea into practice in his workingmen’s Museum, near Sheffield, his influence has undoubtedly done much to stimulate the development of the “ people’s Museum.” The same spirit inspired Sir Henry Cole when he said to the people of Birmingham in 1894 : “ If you wish your schools of science and art to be effective, your health, your air, and your food to be wholesome, your life to be long and your manufactures to improve, your trade to increase and your people to be civilized, you must have Museums of science and art to illustrate the principles of life, wealth, nature, science, art and beauty.”

And I never shall forget the words of the late Sir Philip Cunliffe Owen, who said to me some years ago : “ We educate our working people in the public schools, give them a love for refined and beautiful objects, and stimulate them in a desire for information. They leave school, go into the pursuits of town life, and have no means provided for the gratification

of the tastes they have been forced to acquire. It is as much the duty of the Government to provide them with Museums and libraries for their higher education as it is to establish schools for their primary instruction."

2.—The development of the modern Museum idea is due to Great Britain in much greater degree than to any other nation, and the movement dates from the period of the Great Exhibition of 1851, which is recognized upon the western side of the Atlantic as marking an epoch in the intellectual progress of English-speaking peoples. The munificence with which the national Museums of Great Britain have been supported, and the liberal-minded manner in which they have been utilized in the cause of popular education and for the promotion of the highest intellectual ideals, has been and still is a source of inspiration to all in America who are labouring for similar results.

3.—The future of the Museum, as of all similar public institutions, is inseparably associated with the continuance of modern civilization, by means of which those sources of enjoyment which were formerly accessible to the rich only, are now, more and more, placed in the possession and ownership of all the people (an adaptation of what Jevons has called "the principle of the multiplication of utility,") with the result that objects which were formerly accessible only to the wealthy, and seen by a very small number of people each year, are now held in common ownership and enjoyed by hundreds of thousands.

In this connection the maintenance of Museums should be especially favoured, because these, more than any other public agency, are invitations to the wealthy owners of private treasures to give them in perpetuity to the public.

4.—If it be possible to sum up in a single sentence the principles which have been discussed in the present paper, this sentence would be phrased in these words :

THE DEGREE OF CIVILIZATION TO WHICH ANY NATION,
CITY OR PROVINCE HAS ATTAINED IS BEST SHOWN BY
THE CHARACTER OF ITS PUBLIC MUSEUMS AND THE
LIBERALITY WITH WHICH THEY ARE MAINTAINED.

The PRESIDENT, alluding to the question of putting donor's names upon specimens exhibited in Museums, said : there were circumstances under which such a course was necessary. If a cocksparrow was presented to a Museum, it scarcely seemed desirable or necessary to display the name of the individual who had given it. There was no need of a label in that case. But if they had, say, a Great Bustard presented to a Museum, it was of the utmost consequence that all circumstances connected with it should be carefully recorded. In the case of any really valuable specimen, it was certainly important, not only to have the name of the donor in the catalogue, but also upon the case or label of the specimen so that it might be seen at once where it came from.

There was another point upon which he would like to make a remark, and, that was the transfer of specimens. It was out of the question as a rule, but he believed it might be very important in the case of certain type specimens if such transfer did take place. It often happened that a type specimen came into a Museum, which had no collection of importance to which the type belonged, and consequently the type representative of the group became practically lost to science. In such case it was much to be wished that the type specimens could be transferred to some other Museum in which its allies were even fully represented, and where it would be treasured in connection with other types.

He entirely agreed with the contention that a Curator should not accept any specimens unless of great value, which had conditions attached to them. Another point mentioned in the Paper was that it was extremely desirable for a Curator if he could find time—and he ought to be able to find time—to take up some speciality. It would give him a zeal, an interest in his work, which could not be attained by the mere slavery of arranging, labeling, and mounting, and the results of his work would be valuable to the collection.

MR. W. E. HOYLE (Manchester), said : The writer not only seems to have a vast experience, but has also an epigrammatic way of putting things, which, I think, is more common on the other side of the Atlantic than here. He seems to have, in large measure, what he himself has alluded to as the "Museum genius"—the power of seeing exactly what is wanted for the particular purposes of his subject. I think that the definition of a label as being something which is intended to take the place of the Curator in the Museum, gives us in a nutshell what should be in our minds when we sit down to write a label. I suppose every one in this room has tried to write a descriptive label, and will therefore appreciate the correctness of Mr. Goode's description of the difficulties which beset the tyro in this kind of literature. However well a label is written, my personal experience is that there is nothing which tends to make a Museum so interesting as the personal explanations of a Curator. I constantly hear visitors say that they would come oftener to the Museum if there were somebody to take them in hand, to tell them what to look at, and to show them what things meant. I have explained to them that we have descriptive labels, which ought to do the same thing. But somehow they don't find the reading of these nearly so interesting to listening to what is told them.

MR. WILLIAM WHITE (Sheffield), said : The paper is so extremely suggestive and exhaustive that I think it is almost a pity we could not have its vast number of points discussed one by one on different occasions. It would be simply impossible within two hours, even if this were the only paper we had before us, to treat it as it deserved. I hope that various members of the Association will, from time to time, bring forward some portions of it as they see fit for proper discussion separately. It is a great pity for such papers to become buried in an annual report. Part of it has, as it is, been taken as read, and I am afraid it may remain so with very many of us. So far as I am concerned I know it will not be so, though we know what is too apt to be the case when an official report is received. But it is so full of valuable subject-matter that the thought suggested itself to me during the reading of the paper, that it would be a great advantage if our Annual Report could have a full index at the end of it. We should then be able to turn at once to any point that occurred to us from time to time for helpful reference. There are only two points upon which I would venture to offer an opinion. The first is one to which Mr. Hoyle has already referred, with regard to the presence of a Curator in the Museum as a guide to visitors. My own experience is that it is desirable that the Curator should, whenever he can manage to do so, help visitors to understand what may require explanation. Invariably visitors remark to me,

that such an exposition makes all the difference to their visit, and they come again and again, bringing friends with them. The difficulty, I know well enough, is that the time that is occupied is time the Curator cannot very well spare. This is a difficulty which, in many cases, is insuperable, but it is still an advantage the Curator should never lose sight of. It is, in my own case, generally, though by no means always, a matter of previous appointment. The general number, I advise, is not more than fifteen, which, I consider quite as many as can see the specimens at a time. The other point is connected with the labelling of specimens. I am strongly of opinion that the names of donors should be kept out of the cases altogether. We have quite enough to put on the labels as it is, and if we had to include all that has been suggested in the paper, our labels would have to be the size of blackboards. We do not want either to extend the idea of personal advertising in our Museums. It is surely quite sufficient for a donor, who, I will be liberal enough to suppose, has at heart the true interest of the institution, to receive due thanks for and acknowledgment of his gift, and for the record to be preserved in the annals of the Museum.

Mr. J. J. OGLE (Bootle), said: There are one or two things I would like to make comment upon: in respect of the rejection of specimens, I have had the pleasure—the morbid pleasure—of recommending my committee to refuse a gift. The gift consisted of a dozen tail feathers of the Lyre bird. I think it was a barbarous gift, a mutilated specimen of a bird that is rapidly becoming extinct. I learnt afterwards that the gift was only a very small portion of a large consignment that had reached Liverpool by ship a few weeks ago, and that one of the consignees had offered the feathers thinking they would be acceptable to the Museum. I explained to him that if we accepted his gift it might be looked upon as encouragement to an act of barbarity, the bird being almost extinct. He was open to reason, and saw it at once. Next day he brought me a really valuable gift, which consisted of a number of weapons of war which had belonged to the aborigines of Victoria. Another point of the paper I desire to call attention to, is that respecting the information one may wish to put upon labels. It is often difficult for a man, who has perhaps only a knowledge of natural history confined in a narrow groove, to get the kind of information he desires. Some time ago I had a number of birds to arrange, and I tried really to carry out the suggestions which I saw in Mr. Ruskin's *Love's Meinie*, in regard to the information one should give concerning each bird. I think there are eight or nine questions which he there sets forth as being questions which one should be able to answer. I got together quite a library of books, and set about answering the questions upon the authority of other people. But I found it utterly

impossible. With very few indeed of the birds was I able to get the information necessary to answer these very reasonable questions. If this Association could do something by bringing to bear on these questions the experience in the field of a good many of our Curators—men who are good field naturalists as well as good histologists—it would be a great boon, and help us to answer the questions which visitors ask in our Museums. In regard to visitors to Museums:—You are aware, no doubt, that the Education Department has this year, for the first time, allowed visits to Museums from classes in schools, to count as school attendances. Recently, I had the pleasure of welcoming two or three classes of girls from the National Schools, to the Bootle Museum. I gave them a little outline of the general grouping and arrangement of the natural orders in the mineral, vegetable, and animal kingdoms. They listened for half-an-hour with great interest, and when they left the Museum they expressed a desire to come again at a future time to hear fuller explanations of some of the special groups. I think that that kind of work might be encouraged very wisely by all of us. Also, a very few weeks ago my assistant had the pleasure of giving an address on a small group of corals, to a school of girls from a Convent close by. I had a very nice letter indeed from the Lady Superior of that institution, thanking me and saying that if she had known it was going to be so interesting she would have brought a larger number to the Museum. She hoped in future she might come to avail herself of such advantages. This is a sort of work we can do very well. It will popularize the Museums to a considerable extent, and we shall find supplies coming in much more rapidly in the future than in the past.

MR. JAMES PATON (Glasgow), after jocular reference to the rapidity with which the paper had been read, said : There is no doubt as to the very great value of the paper, and I agree with Mr. Hoyle that it is the most valuable communication, practically for Museum purposes, which has ever been laid before the Association. It is a paper by a man of very wide experience indeed. It is also, as has been pointed out, a paper written in exquisitely terse language. There is not one word in it but what tells its story—not one word superfluous. In fact the paper may be taken as a model for others to be written from. It is an excellent example of the big label which every Curator should carry about in his head. To know what he is going to do is the first thing every person should make sure of before beginning work of this kind. I fear there are many people who don't follow that common-sense method. Probably, if they are asked what end they are working for, they will answer : "Oh, to get there, I suppose." But if we have that paper in our heads and carry out the principles which Mr. Goode lays down, we will not have so much wasted

labour in the future. It would be well if those exceedingly valuable memoirs, which are every year published by the National Museum of America, and which are distributed so freely and generously, were better known. In England they do not so freely distribute official publications as they do in America. Here, after they get the information, and when they have paid the whole, or at least the major portion of the expense, it appears to be their endeavour to hide the information acquired by so much labour and cost from the people, to try to minimise the work done, and to get as little as possible out of the effort which has been made. Take, for instance, the geological survey of this country. An enormous amount of valuable material has been collected by means of that survey. The whole country has been gone over time after time, and the maps and memoirs that have been published—not published, printed—by one geological survey, have cost this country as much as an ironclad. The documents are placed in the hands of the Stationery Office, and after all the expense that has been incurred, the Stationery Office takes care so to regulate the printing of those papers that the very minimum of usefulness is got out of the publications. I am sorry to say this is the case with a great many official publications. Not so on the American side. There, when they get information they recognise that that information is for the public, and that the public must have it. Another thing in regard to which I think we may take a model from the American side is their mode of collecting. They find that the National Museum of America wants a special collection from a special country, or they want to work up the ethnography of a tribe still existing more or less in its primitive condition. They send a commission to the region and there they thoroughly investigate the conditions under which the people live, they collect their implements, &c., for the Museum, and the results of their work are put into the form of a memoir and officially published. They give a vast amount of useful information—most reliable information. I can only say that I hope we shall have, in some early accessible form, the exceedingly valuable and well-arranged statement on the principles of Museum administration which Mr. Goode has put before us.

Mr. H. M. PLATNAUER, said: This Association is engaged in trying to squeeze out of the Government the free publication of such papers as those of the geological survey. We are making every effort to get some copies of the publication placed in each Museum. At Dublin a resolution was passed that we should try, if possible, to get the maps published for each Museum, especially those bearing upon the district of which that Museum is the centre. I hope in due time we may be able to report success in this direction. With regard to the magnificent paper—for it is an excellent paper, as has been well said—it stands in the first rank even

among the very good papers with which we have been favoured. Having pointed out how the various component parts might each be taken separately and discussed as a paper in itself, Mr. Platnauer proceeded to allude to the subject of publishing the names of donors of gifts to Museums. It may be necessary, he said, to sooth the morbid vanity of the donor by attaching his name to the specimen, but I think it is advisable to do that in such a way that it can afterwards be detached. A label bearing his name might be put on a separate slip, which could in due time be removed. I do not like to see a man's name close to a specimen with which it has absolutely nothing whatever to do: it is of no use to the ordinary visitor. I am not speaking now of catalogues. In cataloguing, we cannot be too careful to state the source. A most important point in cataloguing a specimen is to state who gave it, and so forth. We have then a guarantee for accuracy in the statement of the locality of the specimen. For instance, we possess part of a collection made by Mr. Bean. Mr. Bean was particularly careful in his statements; what he gave could be relied on. He never would take any specimen the history of which was in the least doubtful. So that in numerous cases the name of the collector is important to the student in the catalogue of a Museum. But the catalogue of a Museum, and the label attached to a specimen for the general public, are widely different things. The information conveyed by one only to a small extent overlaps the information of the other. This giving of specimens, coupled with conditions, is a serious nuisance, as every Curator knows. Everyone has had a gentleman coming in and giving a specimen, generally altogether useless. Afterwards he looks around the collection and does not see it. It isn't anywhere; it isn't being exhibited. He would like to see it put in a proper place with a label to say that he had given it. He takes you round and points out a place, and the place he chooses is generally a conspicuous one, where it would be absolutely and hopelessly out of place in every sense of the word. That, however, troubles him very little. In too many cases donations are self-advertisements, nothing more nor less, in a most unpleasant form. I can forgive a man for posting an advertisement on a wall and putting his name upon it. It is then a matter of business pure and simple. But I object to the man, who, under the cloak of zeal for science and the advancement of knowledge, poses before the public as a benefactor, when his work in that character should be unobtrusive. At Nottingham they have adopted the plan of refusing all donations which are coupled with any condition whatever. It is a resolution which might be very wisely copied by many other Museums. Of course some exceptions have to be made. There are a few men who have to be

considered, and we should not therefore apply this regulation too rigidly. But, I believe, that refusal in certain cases will influence others, and that they will cease from hampering us with restrictions.

Mr. HOWARTH said: There is one part of the paper I should like to have heard read. But perhaps it will be more delightful to read it oneself, and to study it carefully through. The subject of Commercial Museums has received very little attention in England. In the large centres of industry I think there is some scope for very excellent work being done in the way of Commercial Museums. The American people ought to be able to give us some information upon the subject, and I therefore look forward with some interest to learning something about Commercial Museums, on that side of the Atlantic. We are, in a small way, taking it up at Sheffield. With regard to gifts to Museums I entirely agree with what Mr. Platnauer has said. It is undesirable to accept anything which has a condition attached to it, or that is unsuitable for the Museum. Why there should be any difficulty in refusing gifts I cannot conceive. In the course of a year we probably refuse quite as many as we accept. We refuse anything offered to us unless it enters into the scheme of the Museum. We laid down a definite scheme at first as to what we intended to illustrate in the Museum, and anything which comes under that scheme and will help to carry it out, we accept. Where it does not, we decline it emphatically but courteously. Difficulties sometimes arise with bequests. We have often to refuse bequests. Not very long ago we had a collection of pictures bequeathed to us, which we declined. In another case we had a collection of pictures left us. We were quite willing to take a few of them, but we could not accept the lot. The committee arranged with the trustees, and we were allowed to pick out a certain number of the pictures, which we added to the collection. The others we declined. A difficulty arose a few years ago about a very curious offer to the Museum. It was a handkerchief which had been used in binding the eyes of some man who had been robbed on the highway by a notorious local highwayman, who was afterwards hung on the road side. When this was sent to us we thought it was meant as a joke; but there happened to be a member of the committee who was very much interested in the history of Sheffield, and who lectured in different parts of the town on reminiscences of old Sheffield. He thought this was an admirable thing for his lecture, and did not see why we should not accept it. Ultimately we accepted it and locked it in a cabinet. Whenever he gave a lecture it was sent to him, and he returned it when done with. That is the only use to which it is put. It serves a purpose in connection with the history of Sheffield, and we keep it strictly for that purpose. I do not share the feeling of

148 PRINCIPLES OF MUSEUM ADMINISTRATION.

difficulty or disinclination to put the name of the donor on his specimen. But I strongly object to accepting anything with conditions to it. It is a simple matter to say that such and such a thing was given by so and so. In some cases it is useful. It is useful to the investigator to have the fact that a certain specimen came from a donor, who may, perhaps, be an authority on the branch of science to which the specimen belongs. It is a small matter indeed to put the name of the individual who presented a thing just on the bottom of the label. When Mr. Hoyle was speaking of the Museum under his charge, I felt that he must be a man of most exceptional energy when he could afford to give his time so liberally to visitors who came to his Museum. It is always a pleasure to walk round the Museum with intelligent visitors, but it is often a devotion of time to one individual, that may cause loss of information to many others. I feel that efforts should rather be in the direction of making the Museums, to as great an extent as possible, self-explanatory. This applies more particularly to the case of the free public Museums.

THE DEVELOPMENT OF A LOCAL MUSEUM.

By A. MEEK, B.Sc., F.Z.S.

ALTHOUGH we now have a few Museums which occupy a first-class place among the Museums of the world, and know that the collections are very rich indeed, we have to remember that the history of these institutions is yet a very recent one, and that as educational factors they are still in their infancy. I venture to remind you that they have often taken origin in such collections of curiosities as the Tradescant's Ark, which gave rise to that quaint old assemblage of historical records the Ashmolean Museum. The Newcastle Museum we have just learned had a very similar but much more recent origin in the Wycliffe collection. We have indeed to thank the individual collector for preserving much material of value and for starting many of our well-known Museums. Even a larger percentage have been formed around the collections made by societies, which still more naturally became public property. Beside the ordinary local Museum we may simply mention the University collections which often have something of a history as we also find on the continent. St. Andrew's, for example, is said to have had its origin in the fifteenth century. And now our modern colleges are forming their Museums, and secondary schools have found the introduction of museum objects a necessity.

A glance at the literature also shows the short period of history through which Museums have passed. We

find before us a heap of catalogue and guide books, isolated articles, and reports of lectures. *The book* of Museums has still to be written, but now with such a body as the Museums' Association we have a means of acquiring information of a wide character, which will gradually appear in the publications of that body, and should thus form a means to that end. There are of course many excellent reports of a few institutions connected with colleges or provided with efficient workers, and the monographic catalogues sent out from the National Museum.

It is easy to see that the growth of a Museum after its inception is a matter of environment. Populous and rich centres are of course favourable to development; and we have all stages illustrated in the Museums of this country. They all had a simple and humble origin, but while some have been enabled to have buildings and collections grow in relation to one another, there are many which present rich collections and little space for exhibition, and others again which are poor in both. The poorer and even some of the so-called first-class Museums are still further hampered by there being no provision for an adequate Curator to collect and choose and arrange materials.

The tendency to exhibit whatever came to hand is forcibly shown in the majority, and we may see in consequence that many of our present-day Museums present a very mixed display. I have seen in a third rate Museum for example, specimens of widely different animals, and relics of antiquity all lying together in the same case. Here the accumulation of specimens was greater than the means of disposing of them, the Curator was non-existent. And I have still further noted that in such a museum where there is no adequate place for storing specimens till a convenient opportunity occur to

choose for exhibition, that the specimens not only get mixed, but by the death of an interested one, and the trusting to memory rather than careful arrangement and labelling, the original significance and importance of objects that might have been very valuable are lost.

Looking up a little from the smaller institutions we find that more happily placed Museums, with means to provide suitable rooms and workers, were able to avoid such obvious mistakes. Many follow the British Museum in arrangement and aims, attempting in a more or less efficient manner to tell the same story, the larger indeed competing with it for specimens and collections. It is only in a few cases yet that we find an honest attempt to make a local collection or at least to make it distinctive.

Enough has been said in this rapid scramble over the facts to show that we have a gradation of Museums in this country from the condition of mere collections of curiosities to such a Museum as the British Museum with its richness in collections and exhibits.

The objects in a small Museum are of course arranged for permanence, and there is no place for storing, the cases present all their wealth, and should objects be thrust upon them, into the case they must go.

It is little wonder that such Museums are described as aimless collections of curiosities, and that articles have been written pointing out such shortcomings.

Looking now at the more modern aspect of Museums, I wish to say nothing at all about the reserve collections and the value of these, but to dwell upon the exhibitions and the developments that have taken place for making these as educational as possible. It is this suggested value of Museums which is often met with scepticism and the shrug of the shoulders, especially from those whose

tastes lie in the direction of books and prints, and to whom Museums suggest dust and melancholy.

In the first place it has often been proposed to arrange the Museum in a popular and attractive form for the casual visitor. It has been recognised that this sort of visitor passes over the general geological and natural history exhibits very roughly, but will hang fondly over some local relic of antiquity, and especially if it is connected with some scoundrel. There is quite evidently a genuine relish for the curious and the chamber of horrors. But Museums are not meant to encourage this kind of thing—the very opposite. They are a means of education, and a general show of curiosities without some definite aim is not that; there is no objection to vivaria and aquaria, though these are more useful to the student than the so-called casual visitor, who soon tires of them. Attractive cases of self-explanatory groups of animals are more commendable where funds admit of its being well done, and good and not too ambitious subjects chosen. But to attempt to arrange a large part of the Museum in this way is questionable and I should say mistaken policy.

Some application of the existing form of exhibition is necessary for purposes of education, taking the best means available to make the lessons easily read. For natural history collections we have a choice between or a combination of the linear or systematic and the geographical arrangement. I need not make here any attempt to mention Herdman's evolutionary scheme, for it has never, as far as I know, been adopted anywhere, and I shall refer in a moment to Haddon and Parker's suggestion to indicate in Museums the supposed succession of life. For we must admit at once and gladly the immense influence which the generalizations of Darwin and Wallace have

had in the development of the sciences our Museums are means to illustrate.

Such arrangement as is so generally adopted is much facilitated now-a-days by modern methods. Let me mention the introduction of neat and carefully made models of the lower and microscopic animals and plants, of flowers, of studies in embryology; the spirit preparations are now made more attractive in neat specimen bottles and are not necessarily isolated. I should draw attention to an important improvement seen at Hamburg and elsewhere in Germany. The animals are shown in natural attitudes in spirits by using long shallow vertical glass troughs. The manner of mounting and exhibiting the specimens has also been greatly improved, and the cases present many improvements as well. In Berlin, for example, we notice that shallow cases are placed in the windows so that the transparent specimens as Tunicates may be viewed by transmitted light, wings of butterflies, and larva-eaten leaves are similarly shown. Very commonly in German Museums do we find black or brown backgrounds used for light-coloured objects, and light backgrounds for darker specimens. In many places on the continent also we find coloured labels used to indicate distribution. It would be impossible for me in the scope of this paper to point out half the developments of this kind.

It is no longer necessary to have the dark and unattractive looking cases, for we have many examples in this country, as well as elsewhere, of Museums striving to make their cases neat and effective. And we have only to keep a pretty clear aim in view in arranging the specimens, and clearly and carefully labeling them, to succeed in providing a treat for the student, and the neatness and order will impress the visitor perhaps more than mistaken ideas of endeavouring to trap him into looking at things.

Again we have Museums that can afford it, impelled with a desire to aid certain forms of technical education, providing rooms with specimens designed to illustrate important industries. I shall refer in a moment in an ideal case to the possibility of introducing, for example, Agriculture in this manner.

But where it is simply desired by a local Museum, and the devise is an adequate and commendable one, to form a local record of antiquities and natural products, together with some wider illustration of the world at large, let me take you in imagination through what I would call an ideal Museum of this kind. Not only is it one that would allow the Curator plenty of scope, but it also permits, once formed, of easy incorporation of new material, and so is well adapted to a town's Museum where the Curator is perhaps an honorary elected gentleman, or one who has to fulfil a number of other offices besides. For working out the material to its best advantages of course, laboratories and workers are quite necessary, and this can only be done when the Museum is rich or connected with a college.

In the entrance hall of such a Museum the first object we see is a papier mache model, showing at a glance the geographical features of the district, or it may be made of some transparent material like the one shown in the Agricultural Museum in Berlin, and glass uprights placed below at intervals, coloured to indicate the geological structure of the neighbourhood. Maps are provided to still further show the nature of the rocks. Around we find the rocks and their minerals arranged in cases and the localities clearly given by the labels. The fossils found in these rocks are also shown in a similar manner.

The visitor is now directed to the ethnographical and industries collections, let us say to the left. The

antiquities are well shown by many objects illustrating the stone age. A model of a cairn and the actual urn and bones got from it are to be seen. Flint implements of all kinds occur, and in every case the locality is clearly given and the whole made to form a running story. We see clearly the crematory habits, and gather from the implements, the work the early inhabitants of the port were capable of doing, and their means of doing it. Mediæval and more modern objects are found in succession arranged and labelled with the same object and as far as can be chronologically. Here we find the spinning wheel, old domestic utensils and furniture. Perhaps even the history of dress might be possible, though only indicated by modern copies.

We next find an attempt to show the progressive improvements made in Agriculture, specimens of old ploughs and old wooden carts with wooden axles; the old creels used panier-like in carrying manure to the fields.; the flails used in threshing. Models might be shown, exhibiting the broad features of an old time farm. Beyond this we see the industries of the place indicated in a very similar way.

Retracing our steps and recrossing the entrance hall, we enter a room in which are the beginnings of the Natural History collections proper. Here we might find on entering such a model illustrating evolution as that referred to in a previous part of this paper. This is a tree-like upright inclosed in a case which may be viewed from any side and bearing models or actual specimens which are meant to illustrate the evolution of life, (Parker), or named blocks arranged on glass shelves and connected together for the same purpose (Haddon). First we have a case showing specimens or pictures of the better known or more important animals which have

undergone extinction. The ancient wild boar and wolf and the more modern badger,* wild cat, polecat, &c., as the locality will determine. Very rare animals might be shown in a succeeding case:—as the marten and otter. Neat preparations follow illustrating the common wild animals of the district—localities in all cases being clearly indicated. The birds occur next in order, and extinct, rare, and common specimens shown in the same way. In both these classes the specimens are arranged in their natural order. Could it be done some neat cases showing natural artistic groups would be a great attraction to this room.

We need not follow the Natural History Museum further. The design is the same in all cases we look at in succession where it is possible to carry it out. Fossils may with advantage be introduced near to specimens now living to which they are closely related. And all the specimens are the product of the district. The botanical collections may be shown in shallow glass cases on the wall but must be neat to be effective. Models may be introduced if they can be at all procured and in the Zoological collections as well. The foreign specimens which the Museum has acquired are arranged under their respective countries. A capital collection might well be added showing the Natural History of the Farm; and structural details of the more important groups might be gradually introduced near the cases of animals they are meant to illustrate.

A larger Museum might prefer to have a fairly representative collection of Geological and Zoological specimens, and use up their foreign material for that purpose. This should be kept altogether separate from

* This was written with special reference to Aberdeenshire.

the Local Museum, and must, of course, be arranged in strictly systematic order.

The idea is simply to point out a way in which the Museum objects might be arranged, so that the story they tell may be as easily read as possible. They first form a good picture of the district, and other specimens of foreign origin are useful for contrast, as showing the produce of certain other countries. The division of labour among Museums is rendered hopeful. Recognition is also made of the industries of the district. The neatness, the careful labelling, the utilization of the best methods, and the simple lessons the arrangement is meant to teach, are in my opinion more important developments than making ambitious attempts at panoramic display.

The PRESIDENT said : I have listened with considerable interest to the paper just read to us. It is one which you at once see is applicable only to very small Museums, in which, owing to insufficient accommodation, the Curator is obliged to bring objects of all kinds, antiquarian or agricultural, into close bearing and connection with the geological and zoological collections. On some points I would like to say a word or two, and first of all—with respect to zoological trees. We are quite unable for the time, owing to the insufficiency of our knowledge, to introduce into our Museums anything like a complete zoological tree. Of course, I do not mean to say we do not know the connection or disconnection of certain great groups. But I have never yet opened any two books on Natural History and seen identical zoological trees. On the contrary, I have had books sent to me in which there was in the middle of the book one zoological tree and an entirely different one at the end. Under these circumstances, I think it is not advisable to adopt in our Museums any definite dogmas respecting the derivation of one group of animals from another.

Secondly : Another point which was mentioned, and which I think is not desirable, is the dislocation of the extinct and the almost extinct and rare specimens from the ordinary specimens. If these are to be put into separate cases, you will entirely break up the zoological sequence and connection.

Thirdly : I have the same reason for objecting to separation of animals according to the countries to which they belong. I spoke last night strongly on the point of a distinct preference being given in a local Museum to a local collection ; but that is a very different question. Just as you have in the British Museum a British collection—a collection from the British Isles—separated from the great collection, so I think in every local Museum you may have, if you wish, your local collection separate from the general collection. When you have done that I think you have gone far enough in the separation of one country from another.

Dr FORBES said : I should like to say a few words, but not exactly in the way of criticising the paper which we have just listened to. With its main features I am in entire agreement. But with reference to the arrangement which has been alluded to as the arrangement of Professor Herdman, I rather think Mr. Meek has made a mistake. He has not exactly described the arrangement of a Museum which Professor Herdman has suggested in his paper in the Trans. Lit. & Phil. Society, Liverpool, xxxix., p. 69., and published separately as an ideal Natural History Museum. Mr. Meek has described it as a number of wires hung from the roof and other arrangements of that sort. Professor Herdman advocated strongly, as Professor Parker has done, the phylogenetic arrangement. I have had an opportunity of seeing and discussing with him in New Zealand, and with Professor Herdman in Liverpool, and I must say I agree thoroughly with them both that it is the only rational and intelligible arrangement of a Museum. Of course, there might be difficulties in adopting the phylogenetic arrangement in small Museums, though I do not see that there should. I follow our President in thinking that we ought not, in regard to such arrangements, to tie ourselves to any final arrangement of trees. Every portion of a Museum should be arranged in a manner to permit of changes when necessary, and in the meantime every part should be in relation to that which is, as far as our knowledge goes, genealogically related to it. At present, a great many Museums are arranged with one group—say, the vertebrata—in wall cases, and the invertebrata in the centre, often a general mixture, which cannot but be utterly confusing to the unscientific visitor. At the present moment we in Liverpool are contemplating a large extension of the Museum, and the arrangement which we propose to adopt is that every group of the animal kingdom shall be by itself and shall lead on to the next higher, according to the most recent and most authoritative information. Every case shall be interchangeable and interfitting, and mounted on castors—there being no fixed wall-cases—and if, as time goes on, changes are necessary, one case can be removed from one part of the room to another and placed near to

that with which its contents have been found to be more nearly related genealogically. Parker's arrangement is very much what I have described, the genealogical relation being indicated by fully descriptive labels and the eye guided by dark rods or lines on the floor, so that the relations between one group and another could be easily followed. A local collection should certainly be in the most important position in any Museum. By the aid of blackboard drawings Dr. Forbes described the construction of the proposed alterations to the Liverpool Museum, where there is a large entrance hall. This is to be entirely devoted to local collections ; while in continuous galleries, running right round a central well, or open area, there will be a phylogenetic arrangement, the vertebrata in the one storey and the invertebrata in the other. From the entrance, where he will meet with the Protozoa and Protophyta, the visitor, as he traverses the various galleries, will encounter higher and higher forms of life, to the highest invertebrates—extinct and recent ; then by ascending a stairway he will find himself amid the lowest vertebrates, which he will follow to the anthropoids and man. Man and his development will be further exemplified in the adjoining Mayer Museum, containing specimens of the handiwork of his savage and civilised conditions.

Mr. H. M. PLATNAUER (York) said : In regard to showing evolution in Museums, I think the best plan to adopt is to bring out as clearly as possible the actual relations which exist between animal and animal, plant and plant, structure and structure, and leave the visitor to draw his own conclusions. What we want to exhibit in our Museums, as far as possible, should be rather facts than theories, or the facts underlying theories, rather than a mere statement of the theories themselves. Of course, we all know that the credit is due to Darwin and Wallace of having singled out those facts so as to show their relation to each other and put them into order as a theory. But once that work is done it is done for all time. I think, for the ordinary observer, it is sufficient simply to emphasise the fact which those theories were built upon, and thus leave him to draw the now obvious conclusion. No great intelligence is required to build from plans when once those plans are made. That is why I should rather prefer to leave the ordinary visitor to construct his evolution scheme himself, simply giving him the bricks wherewith to build, especially when, as was pointed out by the President, the details of those theories have to undergo alteration from time to time. We should have to be prepared to make changes which are not always undesirable in Museums of this kind. The question of local collections is constantly up. The more I consider it the more I come to the conclusion that to attempt local collections is almost useless. To endeavour to teach a man by a

THE DEVELOPMENT OF A LOCAL MUSEUM.

local collection is the same as endeavouring to teach him with a book from which whole chapters have been torn out. To give him a disconnected series and expect from that an entire and clear notion of what life is outside is impossible. I am strongly of the opinion that the best plan is to get a full and representative general series and illustrate it, as far as possible, by local specimens; also adopting some way of emphasising the fact that these specimens are local. I would recommend tinted and differently coloured mounts in the case of local plant specimens, so that the attention of the visitor is called to the fact that these things can be found at his own doors. But simply to give him specimens of the things found round him is to give him a broken series, from which it is almost impossible to give him a connected notion of the world at large. Local collections are most valuable to local natural students, but if you educate your visitor by means of a series, you must give him a connected series. But I would not introduce exotics when local objects would do as well. Proceeding to speak of the qualifications of Curators, Mr. Platnauer said those at present in charge of our Museums had great zeal and considerable knowledge, but that they often were not specialists. Specialists should, as far as they could, evolve schemes so as to simplify the work for Curators. But whoever was in charge of a Museum should be someone who has had some training, even if he could not make his own plans. Specialists could not simplify matters for the man who had no education, though they could, to a great extent, for an educated man. He hoped sometime to see this Association bring forth schemes which any working Curator might work out. But the working Curator must be a man who understood his plans, and the man who understood plans was invariably the man who had some knowledge of building. They wanted actual leaders in their Museums; others could supply good plans which they could carry out with effect.

Mr. MELLIN reply to the discussion, said that he had simply mentioned Herdman's scheme for grouping the whole of the cases to illustrate the evolution of life, and he had always understood that the arrangement had to be followed by a branching system of wires. For Museum purposes he suggested that the case proposed by Haddon, or a similar one by Parker, was all that was necessary. Just sufficient was shown in a single case to show what was believed to be the evolution of the larger groups. It was not desirable to arrange the whole Museum in this manner. After all, though he did not want to enter into objection to Herdman's scheme, it would only be a flattened-out representation. An extraordinary building would want to be provided to logically demonstrate the supposed succession of life. Some form of the systematic grouping

was best adapted for the Museum, and in the one he had sketched out he confessed that he had kept in view, as far as possible, one which was more adapted to a smaller Museum, and which would admit of the easy incorporation of specimens into the existing cases. There was not the danger of splitting up that the President feared, for the specimens of extinct, rare, and common objects would all be arranged in *juxta-position*. Alluding to Peterhead Museum for example, which he had arranged a short time ago, he mentioned that there were one or two interesting collections, as Dawson's *Mollusca*, and very complete collections left by the founder, Mr. Arbuthnot. But even in this Museum the Curator was an old policeman, who had to look after the library and reading-room as well. Though he had a committee of most excellent gentlemen, it was easy to see that in such a Museum without means of storage other than the cases on exhibition, it was most necessary to indicate an arrangement which would permit additions being made in a scientific manner.

WHY NOT A NATIONAL MUSEUM OF AGRICULTURE?

By A. MEEK, B.Sc., F.Z.S.

THE English visitor to the Berlin Museum of Agriculture has perhaps asked himself this question. He has seen the attempt of the Germans to group together a series of objects illustrating the history and present position of Agriculture and Fisheries. The centre of the large hall is occupied by innumerable model and actual machines and implements. In the galleries every corner is occupied by Zoological, Botanical, Geological, and Chemical specimens. The birds, their nests and eggs, fill a large number of cases, and readable labels indicate their agricultural importance. Suitable traps are shown for dealing with those that might prove harmful. The mammals are shown in like manner. A set of Dr. Auzona's models indicate the changes produced in horses' teeth by age. Model and specimens illustrate the important breeds of Farm Animals. There are splendid models and diagrams of Farm Insects as we might call them; and their life-histories are given in neat cases, showing also the plant attacked. Dried specimens of plants are exhibited in shallow wall cases. The large series of seeds, models of roots, the various woods, fungi, and many other exhibits still further indicate the

Botanical side of Agriculture. A good microscope occurs here and there in this gallery, so arranged that a number of sections may be seen under each. An interesting row of bottles indicates the chemical analyses of peas, lupine, potatoes, and even flesh. The minerals are arranged in chemical order. Ideal pictures indicate different palaeontological eras. But here the most striking object is a horizontal model of Berlin in semi-transparent material. Glass uprights are seen through the model and these are coloured to indicate the geological formation of the district. An attempt is made also by models and pictures to teach the various kinds of Fisheries.

In Germany, where education in Agriculture has been carried further than we have been able to do in Britain yet, every Agricultural school has at least a series of models illustrating the more important breeds, and specimens of soils, rocks, and birds. The large institutions provide what agriculturists would term an interesting museum. At Hohenheim, for example, we may see a very similar exhibition to that in Berlin. Implements used at successive periods and in different countries are shown by specimens and models. Manures, soils, rocks, minerals, fossils, herbaria. Models of plants form extensive collections. The structure and divisions of the farm animals are illustrated by specimens, and all this in addition to the equipment of a large farm.

In this country of course, Agricultural Colleges and agricultural departments of Colleges have supplied their teaching wants by what specimens circumstances and means put at their disposal. But an attempt to illustrate the history and present condition of agriculture with interesting comparisons from other countries, on even a moderate scale, has still to be made. Specimens are

doubtless in existence preserved in various institutions, and very often duplicated, that could be used for the purpose. A simple but definite object would want to be set down as regards the exhibition. To be of service, however, it must not be a mere Museum but a working institution for the furtherance of the sciences concerned, and the preservation of collections of agricultural importance.

The desirability of this in Museums in general is quite recognised. There is plenty of room for specialists in the botanical, zoological, anatomical, and pathological departments of such a Museum. How such a Museum may be instituted or what existing body might be proposed to incorporate as a means for furthering research in agriculture, it would be useless for me at this time to suggest. Enough, I hope, has been said to show that we have in agriculture a well-defined subject which could be taught by a series of Museum objects.

The animals, the plants, structural, pathological and analytical details, together with such exhibits as would present interestingly the history of this most important industry and the manner it is carried out would form a series of specimens which would be of immense value to the student of agriculture, and would also be very interesting to students of natural science, for he constantly meets important technical relations in his studies. Not only could agriculture in the generally accepted sense of the word be thus easily and well shown in a Museum, but smaller rural industries as bee-keeping may also be usefully illustrated likewise. The Museum, indeed, is likely to be an approach to an exhibition in its appearance, as it is at once evident that the machines and appliances would be willingly lent by different makers, and changed for new specimens at intervals.

But I fancy that should a large hall be devoted to this exhibition and the farmer knew that he could see the latest appliances there, and actually, as might easily be arranged, at work, that the benefit to him and the attraction would be quite apparent.

The rest of the Museum is in our eyes, however, perhaps much more important and would necessarily be so to the student, and local extension of such in our existing provincial institutions would also, I feel certain, be of great value.

I plead, in short, that taking agriculture as a convenient and important illustration of a technical subject, the value of our Museums as teaching institutions would be greatly increased by rooms devoted to it, and that is why I have ventured to propose for your consideration the question why there is not at least a National Museum of Agriculture ?

ON THE USE OF XYLONITE FOR MOUNTING SPIRIT PREPARATIONS.

By E. HOWARTH, F.R.A.S.

(*Abstract.*)

Xylonite may possibly be found of use as a background to specimens in spirit. It can be purchased in sheets of any thickness, and of various colours, from the Xylonite Company, London, at 3/6 per pound. It is easy to cut with a pair of scissors, can be readily pierced for the purpose of tying specimens to it, and is much more amenable than mica, paraffin, and others substances used for mounting specimens in spirit.

APPENDIX TO THE PRESIDENT'S ADDRESS.

I would observe that the most economical arrangement as regards both space and money is one in which trays and tubes are employed. The *best* arrangement is one in which the glass topped boxes take the place of both trays and tubes. This is, however, more expensive and requires more space. For example, a drawer in my collection at this moment contains 302 tubes of shells of the genus *Rissoa*. If fitted in the smallest sized boxes the drawer would hold 144. But the contents in the latter case would be seen to much greater advantage, and the whole would become a show as well as a working collection.

In either case the bottles containing spirits are interpersed among the dry things.

I am informed by a friend who has used Gutta Percha Stoppers that after a time they stain both the spirits and specimens contained in them. No doubt that there is a difference in the manufacture and preparation of such stoppers, as I have bottles with gutta percha stoppers received a considerable number of years ago from the United States National Museum, in which there is no trace of such staining.

GENERAL NOTES.

THE first subject that claims our attention is the heavy loss that the Association has suffered by the death of Dr. Valentine Ball. Dr. Ball watched the formation of the Association with warm and sympathetic interest, and had contemplated a meeting in Dublin some time before circumstances enabled him to give the invitation. The meeting in question is so recent that no detailed reference need here be made to it. Nor is it necessary here to speak of Dr. Ball's career, as the President has dealt with this subject in the earlier part of his Address. All that we need do now is to call the attention of our readers to the steps that are being taken to perpetuate Dr. Ball's memory. It is proposed that a marble bust be placed in the National Museum of Dublin, for which institution he has done so much, and (if possible) a portrait will be painted and placed in some suitable place in the Museum buildings. Dr. Samuel Gordon (Hume Street, Dublin) has kindly undertaken to act as Treasurer of the Fund raised for the above purpose.

The Chester Society of Natural Science has purchased and opened a new room at the Grosvenor Museum, in which the local collections have been arranged. In these collections the unnatural break between recent and extinct forms of life is abandoned; photographs of "restored" animals are used where fossil remains are imperfect. Another interesting point is that in several cases complete life-histories of species are given. Mr. Newstead is steadily increasing his valuable series of insect-preparations.

At the Liverpool Museum a large store-room has been converted into a gallery for the exhibition of Ethnographical Collections. The gallery was opened with an impressive ceremony on June 19th. Dr. H. O. Forbes, the Director, gave an able and interesting address, in which he described the purpose and scope of an Ethnographical Museum, and reviewed the history of the Liverpool collections. Addresses were also given by the Lord Mayor of Liverpool, Mr. W. H. Picton, and Sir W. Forwood.

Mr. Roland Trimen, F.R.S., has resigned his position of Curator of the South African Museum. He is succeeded by Mr. W. L. Sclater, Curator of Eton College Museum.

Mr. Lomax is bringing out a new illustrated Catalogue of the Collection of Birds in the Brighton Museum. The Library and Museum Committee has resolved to spend £115, instead of £100, on this Catalogue. The Committee has also approved a plan for the extension of the Library, Museum, and Art Gallery.

The Tasmanian Museum has recently made extensive additions to its collections of minerals and ethnological specimens. It now has the best collection of New Guinea implements in the colonies, except that of Sydney.

The Essex Field Club, which some time ago established a County Museum in Chelmsford, has quite recently opened Queen Elizabeth's Lodge, Chingford, as a free local Museum for Epping Forest. The Zoology, Botany, Mineralogy, Geology and Archaeology of the district are well represented, and it is hoped that in time they will be completely illustrated. Mr. William Cole has accepted the position of Honorary Curator of the Museum.

Several Museum Handbooks have reached us, but it is impossible to give more than brief notices of them here.

From Manchester no less than eight handbooks have been sent. The *Handy Guide* is a little pamphlet of 20 pages, sold at the very cheap rate of one penny per copy. It is intended to help the visitor whose time is limited by sketching the general arrangement of the Museum, and pointing out the chief objects—and very well it fulfils this purpose. It is succinct, but admirably clear. For the guidance of those who wish to make a more careful inspection of the Museum, there is the *General Guide*, price twopence. This little book condenses a surprising amount of useful and interesting information into a space of about 50 pages, and it is rendered still more attractive to the general reader by the introduction of several excellent illustrations. It is not within our province to criticise the *Outline Classification of the Vegetable Kingdom* or the *Outline Classification of the Animal Kingdom* as schemes of classification, but as both these pamphlets are labelled "Museum Handbooks," we would plead for the occasional introduction of a few terms understood of the vulgar among the stern ranks of Greek and Latin names. The *Descriptive Catalogue of the Embryological Models* is an excellent guide to a most useful and instructive series: from the nature of the case it is necessarily a student's handbook. The *Catalogue of Type Fossils* is, of course, a handbook for specialists: indeed it is scarcely a Museum handbook in the proper sense of the term. These remarks apply in great measure to the excellent and exhaustive *Catalogue of the Hadfield Collection of Shells*. It is a matter of special regret

to us that our notice of the *Catalogue of the Library* has to be cursory, for the brevity of our comments is here in glaring disproportion to the importance of the work under consideration. The Catalogue is arranged according to the subjects, but it also has a full list of authors, and its utility is further increased by an Index of subjects at the end. The system adopted is the Dewey Decimal system, and this catalogue is the first published in this country in which that system has been fully adopted. Mr. Hoyle is to be congratulated on the production of this catalogue which will, we hope, prove a model for many others yet to come.

The Reports and Records of the Australian Museum (Sydney) shew an extraordinary amount of activity on the part of the Curator and his staff. We regret to note that the Museum still continues to suffer from the commercial depression which over-shadows the whole continent, but the staff, though diminished in number, shews no diminution in zeal and energy.

The *Guide to the Collections in the Canterbury Museum* (Christchurch, New Zealand) is one of the most extraordinary shilling-worths of information that we have ever met. Captain Hutton has condensed into a book of little over 200 pages information on almost every subject susceptible of Museum illustration, but, condensed as the matter is, it is put into so readable a form that the most indifferent could not fail to be interested. Plans of the galleries are interspersed.

From Bergen we have received the *Aarbog* for 1892, but this is a record of research rather than a Museum handbook. We must content ourselves with acknowledging it and thanking the authorities of the Bergen Museum for their courtesy : criticism of the contents of the volume must be left to journals devoted to pure science.

Mr. A. Vaughan Jennings has been appointed Demonstrator in Geology and Botany, and Dr. C. H. Hurst Demonstrator in Zoology, in the Royal College of Science, Dublin.

On November 29th, the Museum of the Perthshire Society of Natural Science was formally opened by Sir William H. Flower in the presence of a large audience, Mr. H. Coates, President of the Society, in the chair. The President gave a brief history of the Society and a short account of the formation of the Museum. Sir William Flower, in his address, spoke of the development which Museums had undergone, and of the enlargement of modern views with regard to these institutions. He touched upon the formation, maintenance, purpose and arrangement of Museums. He urged the need for care and thought in all that concerned Museum

management, the choice of efficient Curators and Assistants, the need for proper fittings and appliances, and the importance of discriminating care in the exhibition of specimens. Especially he insisted that the value of a Museum was to be tested not by its contents but by the treatment of those contents as a means of advancing knowledge. He summed up this part of his subject by quoting with strong approval the saying of Mr. Brown Goode that "an efficient educational Museum may be described as a collection of instructive labels, each illustrated by a well-selected specimen."

Later on in the day, Sir Robert and Lady Pullar entertained over 200 guests in the City Hall. Speeches were made by Sir Robert Pullar, Sir William Flower, Col. Drummond Hay, Mr. Coates, and other guests. Want of space prevents our giving even an abstract of these, but we note with great pleasure the appreciation shewn by some speakers of the excellent work done by Mr. A. M. Rodger, Curator of the Museum.

An Art Gallery and Museum is at present in course of erection in the Kelvin Grove Park of Glasgow, which will present certain unusual features. It is to be provided with a large central hall, in which public functions and musical performances may be carried out; and from each side, in bi-lateral symmetry, there extends two spacious courts, around which are disposed a range of saloons, halls, and galleries. The institution is meant primarily for the accommodation of the Art and Science collections of the Corporation of Glasgow, all of which are at present insufficiently housed and stored as regards space, conservation, and safety. Especially the invaluable Art collection of Glasgow, embracing numerous masterpieces of foremost importance is now housed under conditions of grave peril. The building will cost about £200,000, and towards that sum the Museum and Galleries Committee of the Town Council have received to this date £128,000. Of this amount £53,550 came as principal and interest from the surplus fund of the International Exhibition held in Glasgow in 1888, and the remainder represents subscriptions obtained by a local association formed to aid and, if possible, carry out the building scheme. The Town Council has now taken over the entire undertaking, and the balance required to finish the building will, in the meantime, be supplied from Municipal sources.

The authorities of Glasgow have also on hand schemes of District Museums, or Exhibitions, in the City. A building to cost £20,000, and to form jointly a Winter Garden and Museum Halls, is in course of erection on Glasgow Green; and at Camphill, on the South side, a fine Mansion House is being adapted for an exhibitional centre for that populous district.

The position of Director of the Science and Art Museum, Dublin, made vacant by the death of Dr. Valentine Ball, one of the past-presidents of this Association, has been filled by the appointment of Col. Plunkett, R.E.

Mr. Linnæus Greening has presented to the Museum of Warrington his large and valuable collection of Reptiles and Batrachians, numbering 800 specimens.

Peel Park Museum and Art Galleries contain important collections that will rank them amongst the first-rate institutions of this character in the kingdom. There is, however, a great deal yet to be done with them before they represent the orderly and educational arrangement that properly belongs to the Museum of to-day. Mr. B. H. Mullen, M.A., has made his energy and ability conspicuous in the improvement of the Art Gallery and Museum since his appointment, though, with that marvellous faith in the encyclopædic knowledge and unfailing resources of Curators that Town Councils generally seem to possess, Mr. Mullen, in addition to the Museum and Art Gallery at Salford, has also charge of the Library there. This is almost too much for the most energetic of men. It is, therefore, satisfactory to know that Mr. Herbert Bolton, of the Manchester Museum, has been entrusted with the work of arranging the Geological Section of the Museum. Mr. Bolton will here have an opportunity of developing the excellent scheme of a Geological Museum which he laid before the Association in an able paper at its last meeting, and which is printed in this Report. It is to be hoped that the Zoological collections at Salford will soon receive due attention, and, at least, that a taxidermist may be engaged to save from ruin many of the interesting mammals and birds that are there to be found.

The Ruskin Museum at Sheffield is an institution that is only faintly comprehended by the general public, though all cultured people recognise that it must be of great value from the fact that it owes its inception to John Ruskin. Unfortunately that distinguished art critic has been unable, owing to ill-health, to do more than start, what would have been an ideal Museum had he been able to complete it, setting forth the loftiest and purest teachings of art. The Corporation of Sheffield, in providing a more suitable building for the display of the objects got together for his Museum by Mr. Ruskin than was previously provided by the St. George's Guild, have made it possible to illustrate Mr. Ruskin's idea of a Museum with greater clearness, and added greatly to the value of its teaching. Under the able management of its Curator, Mr. William White, the Ruskin Museum has made steady progress, and he has devoted great

labour in making known the object and purposes of Mr. Ruskin in its establishment. In furtherance of this, Mr. White has just published a large octavo volume, extending to more than 600 pages, on "The principles of art as illustrated by examples in the Ruskin Museum at Sheffield : with passages, by permission, from the writings of John Ruskin, compiled by William White." Herein all the pictures in the Museum have their full history given to them. Most of the pictures are copies of works by various old masters, chiefly Italian, portions of buildings, and other architectural features made by direction of Mr. Ruskin. With the exception of a few original works, the pictures in the Ruskin Museum are not particularly valuable of themselves, their interest lying with the fact that they have been reproduced under the special direction of Mr. Ruskin to show what he considers best in Art. Mr. White has made copious extracts from Mr. Ruskin's writings, has given the history of the original pictures from which the Museum copies have been made, and also a full account of the life of the artist.

Those Museums possessing the publications of the Arundel Society will find in Mr. White's book a reliable history of the original work from which these not very attractive or successful copies have been made. The book evinces entire agreement with Mr. Ruskin's opinions and ideas, a thorough acquaintance with his writings, painstaking research amongst the works of writers on the subjects illustrated in the Museum, as well as a personal acquaintance with some of the principal works of the Italian masters. Never before, probably, has a Museum of such limited extent rejoiced in a guide-book of such large dimensions and exhaustive treatment, and there is no doubt the book will find a large circle of appreciative readers far beyond the limits of the Museum. A few excellent illustrations add considerably to its value, one of these from the original picture of "The Madonna adoring the Infant Child," by Verrochio, not only represents the greatest treasure of the Museum, but one of the finest works of Art in the Kingdom. There are also three interesting illustrations from drawings by Mr. Ruskin.

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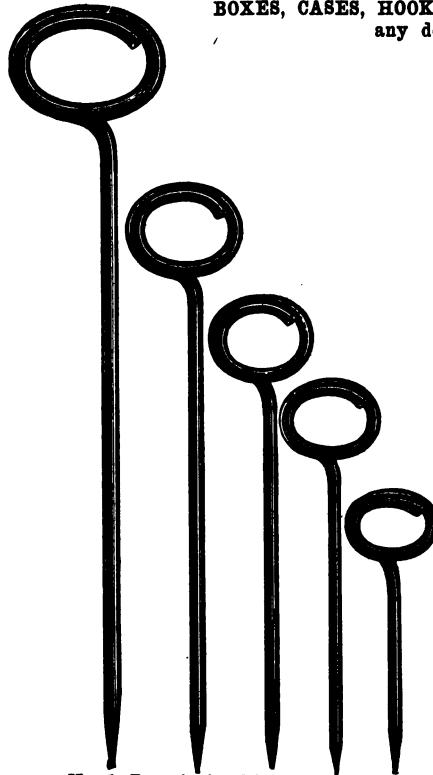
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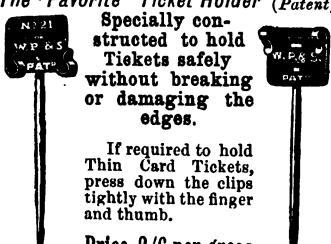
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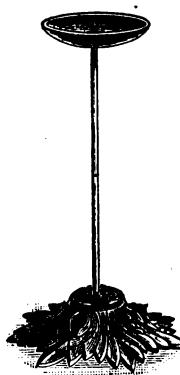
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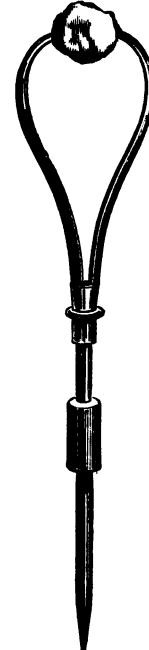
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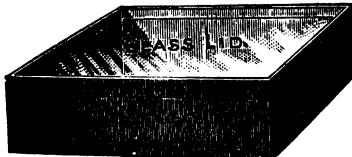
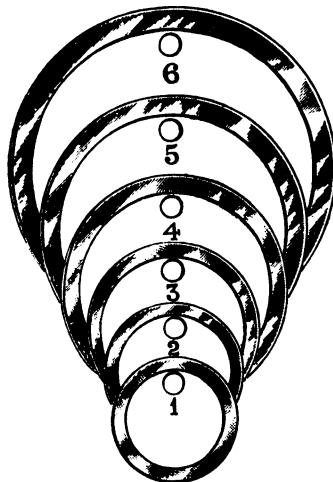
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